

Before the  
Federal Communications Commission  
Washington, D.C. 20554

In the Matter of )  
 )  
Allocation and Designation of Spectrum for )  
Fixed-Satellite Services in the 37.5-38.5 GHz, ) IB Docket No. 97-95  
40.5-41.5 GHz and 48.2-50.2 GHz Frequency )  
Bands; Allocation of Spectrum to Upgrade Fixed )  
and Mobile Allocations in the 40.5-42.5 GHz )  
Frequency Band; Allocation of Spectrum in the )  
46.9-47.0 GHz Frequency Band for Wireless )  
Services; and Allocation of Spectrum in the 37.0- )  
38.0 GHz and 40.0-40.5 GHz for Government )  
Operations )

**SECOND REPORT AND ORDER**

**Adopted:** November 17, 2003

**Released:** December 5, 2003

By the Commission:

**TABLE OF CONTENTS**

| Heading  | Paragraph No. |
|--|---------------|
| I. INTRODUCTION .....  | 1             |
| II. BACKGROUND .....   | 4             |
| III. DISCUSSION .....  | 12            |
| A. Designation Changes.....  | 12            |
| 1. Redesignate the 37.6-38.6 GHz and 41.0-42.0 GHz Satellite and Wireless Services Spectrum .....      | 12            |
| 2. Decline to Add MSS Designation to the 40.5-41.0 GHz Band .....                                      | 18            |
| 3. Modify Part 25 and Part 101 Rules to Reflect New Designations .....                                 | 22            |
| 4. PFD Limits.....   | 23            |
| 5. Gateway Earth Stations .....  | 30            |
| B. Allocation Changes .....  | 34            |
| 1. Add FSS Allocation in the 37.5-37.6 GHz Band.....   | 34            |
| 2. Shift MSS Allocation from 39.5-40.0 GHz to 40.5-41.0 GHz .....                                      | 42            |
| 3. Add Government FSS Allocation to the 40.5-41.0 GHz Band.....  | 50            |
| 4. Add FSS Allocation to the 41.0-42.0 GHz Band.....   | 56            |
| 5. Consider Adding Fixed and Mobile Allocations for Non-Government Use to the 42.5-43.5 GHz Band ..... | 59            |
| 6. Protect Radio Astronomy in the 42.5-43.5 GHz Band .....   | 69            |
| IV. ORDERING CLAUSES .....   | 73            |

## APPENDIX A: LIST OF COMMENTERS

## APPENDIX B: FINAL RULES

## APPENDIX C: FINAL REGULATORY FLEXIBILITY ACT ANALYSIS

## APPENDIX D: CHART OF ALLOCATIONS AND DESIGNATIONS

**I. INTRODUCTION**

1. In this Order, we modify the band plan for the 36.0-51.4 GHz band.<sup>1</sup> We make various designation<sup>2</sup> and allocation<sup>3</sup> changes in the 37.0-42.0 GHz band to create contiguous spectrum for both fixed-satellite services and terrestrial fixed and mobile services (wireless services), which reflects decisions made at the 2000 World Radiocommunication Conference (WRC-2000) in Istanbul, Turkey and the 2003 World Radiocommunication Conference (WRC-2003) in Geneva, Switzerland.<sup>4</sup> In this Order, we finalize the satellite and terrestrial designations required by our “soft segmentation” approach and adopt service rules for satellite services, including gateway definitions and power-flux density (PFD) limits. We will address in separate service rulemakings additional service rules for satellite and terrestrial systems’ use of the designations we adopt in this item, including the precise conditions applied to the satellite PFD limits we adopt here, and proposed rules to coordinate certain types of earth stations operating in the V-band spectrum. We also will address in future rulemakings the National Telecommunications and Information Administration’s (NTIA’s) request to delete Broadcasting-Satellite Service (BSS) from the 42.0-42.5 GHz band and to protect Radio Astronomy operations at 42.5-43.5 GHz from satellite services in adjacent downlink bands. By making these designation and allocation changes, we bring certainty to systems currently operating in the 37.0-40.0 GHz portion of the spectrum and codify the concept of “soft-segmentation,” and allow ubiquitous deployment of fixed service and fixed satellite service operations to commence in the V-band.

2. The major decisions in this *Second Report and Order* are as follows:

- Redesignate the spectrum available for wireless services from the 41.0-42.0 GHz band to the 37.6-38.6 GHz band, redesignate the spectrum available for satellite uses from the

---

<sup>1</sup> We use the term “V-band” in this Order to refer generally to the frequencies in the 36-51 GHz band. See *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band, Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*, IB Docket No. 97-95, Further Notice of Proposed Rulemaking, FCC 01-182, 16 FCC Rcd 12244 (2001) (*V-band Further Notice*); *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands, Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.0-47.0 GHz Frequency Band for Wireless Services, and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*, IB Docket No. 97-95, Report and Order, FCC 98-336, 13 FCC Rcd 24649 (1998) (*36-51 GHz Order*).

<sup>2</sup> A designation provides an allocated service or services use of a specific frequency band for which other services may also be allocated. Designations are only needed where bands are allocated to more than one co-primary service and sharing between these services may be difficult. See *36-51 GHz Order*, 13 FCC Rcd at 24650 n.3.

<sup>3</sup> An allocation is an entry in the Table of Frequency Allocations of a service or services for use of a specific frequency band.

<sup>4</sup> The International Telecommunication Union (ITU) holds multi-national World Radiocommunication Conferences (WRCs) at two or three year intervals to establish international provisions governing the use of the electromagnetic spectrum.

Government interests, finalize the *Millimeter Wave* and *39 GHz* rulemaking proceedings, and address the inherent difficulties in frequency sharing between ubiquitous terrestrial wireless systems and fixed-satellite systems.

6. Following issuance of the First V-band Notice, the Commission adopted a band plan for non-Government wireless and FSS services in the *36-51 GHz Order*. The plan recognized that forced sharing between services intended for communications with ubiquitous consumer terminals would likely result in undue technical constraints on one or both of the services. These technical constraints would not permit FS or FSS systems to achieve their full potentials. The *36-51 GHz Order* designated a total of four gigahertz of spectrum for ubiquitous FSS services in the 37.6-38.6 GHz and 40.0-41.0 GHz bands for downlinks, and the 48.2-50.2 GHz band for uplinks. The Order also provided 5.6 gigahertz of spectrum for wireless services. The *36-51 GHz Order* retained primary wireless designations in the 38.6-40.0 GHz and 47.2-48.2 GHz bands, and added wireless designations in the 37.0-37.6 GHz, 41.0-42.5 GHz, 46.9-47.0 GHz, and 50.4-51.4 GHz bands. The *36-51 GHz Order* also re-allocated the 42.5-43.5 GHz band for exclusive Government use and the 47.2-48.2 GHz band for exclusive non-Government use.

7. After the Commission adopted the *36-51 GHz Order*, the U.S. delegation to WRC-2000 reached a consensus on a proposal for sharing portions of the 36.0-51.4 GHz band. The delegation consisted of wireless and satellite industry representatives as well as Government representatives. The delegation recognized that both wireless and satellite systems operate most efficiently in an allocation of contiguous spectrum and that satellites need a globally consistent allocation. Additionally, the delegation was aware that many wireless services around the globe operated below 40.0 GHz, while few operated above that threshold. The delegation thus developed a band sharing arrangement for the 37.5-42.5 GHz band consistent with these observations and eventually introduced the key provisions of this consensus approach at WRC-2000.<sup>14</sup>

8. The band sharing arrangement proposed a system of "soft-segmentation" that would permit both FS and FSS operations in co-primary allocations throughout the 37.5-42.5 GHz band. The soft-segmentation proposal sought to encourage ubiquitous FS deployment below 40 GHz by having satellite operators meet more restrictive PFD<sup>15</sup> limits below 40 GHz and encourage ubiquitous FSS deployment above 40 GHz by permitting more liberal PFD limits above 40.0 GHz. The proposed PFD restrictions would encourage wireless use of the 37.5-40.0 GHz and 42.0-42.5 GHz bands, and encourage satellite use of the 40.0-42.0 GHz band.<sup>16</sup>

9. In June, 2000, WRC-2000 (1) adopted a comprehensive sharing arrangement for FS and FSS in the 37.5-42.5 GHz band based largely on the consensus approach that the U.S. delegation supported; (2) adopted Resolution 84 (WRC-2000),<sup>17</sup> which identified the 37.0-40.0 GHz and the 40.5-43.5 GHz bands as available for high-density fixed service (HDFS) operations; (3) adopted an FSS allocation in the

<sup>14</sup> *V-band Further Notice*, 16 FCC Rcd at 12248, ¶ 8

<sup>15</sup> In this context, PFD represents a measure of the amount of energy emitted by a transmitter that is present over a unit area at the Earth's surface or at the satellite and is a critical factor in determining whether satellite systems can successfully share spectrum with other services or satellite systems. See, e.g., *Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range*, ET Docket No. 98-206, Third Memorandum Opinion and Order, FCC 03-24, ¶ 1 & n 3 (rel. Feb. 6, 2003) (citation omitted).

<sup>16</sup> The band 37.0-37.6 GHz is allocated to non-Government Fixed and Mobile services and would be used for FS operations in association with the 37.6-40.0 GHz band.

<sup>17</sup> Invites 7 of ITU-R Res. 84 (WRC-2000).

additional service rules must be developed before all V-band satellite operations can commence,<sup>6</sup> we believe the changes adopted today are important not only to the licensees and applicants, but also to the public at large.<sup>7</sup> This will provide certainty necessary for FSS operators to begin construction, and for FS operators to understand the parameters of the environment in which they can compete. We believe the changes adopted today will ultimately provide consumers with new services and benefits by accelerating the deployment and increasing the efficiency of telecommunications in a largely unexploited portion of the radio frequency spectrum.<sup>8</sup>

## II. BACKGROUND

4. In 1994, the Commission initiated a rulemaking proceeding to open 18 gigahertz of spectrum for commercial use between 40.5 GHz and 153 GHz. In the *Millimeter Wave Notice*,<sup>9</sup> the Commission proposed to allocate the 40.5-42.5 GHz and the 47.2-48.2 GHz bands for new millimeter wave technology.<sup>10</sup> In 1995, the Commission proposed rules for fixed wireless (point-to-point) services in the 37.0-38.6 GHz band, and competitive wireless operations in the 38.6-40.0 GHz band.<sup>11</sup> New technologies, however, increased the demand for spectrum allocations in the 36.0-51.4 GHz band and complicated these two proposed rulemakings.

5. In 1996, Motorola filed a petition for rulemaking seeking allocation of the 37.6-38.6 GHz band to FSS (space-to-earth direction) on a co-primary basis with wireless services. In late 1996, the Commission established a working group comprised of all interested Bureaus and Offices. This working group met informally with interested industry participants and developed band plan options to accommodate future uses of this band.<sup>12</sup> In 1997, after reviewing the conclusions of this group, the Commission adopted the *First V-band Notice*.<sup>13</sup> The *First V-band Notice* proposed a band plan for the entire 36.0-51.4 GHz band. It was felt that this band plan would settle competing satellite, terrestrial, and

<sup>6</sup> Although we adopt PFD limits for the 40.0-42.0 GHz band at this time, rules for satellite-to-satellite sharing between Geostationary Orbit (GSO) and Non-Geostationary Orbit (NGSO) networks are also necessary. We will address these inter-satellite system sharing rules in a future rulemaking proceeding.

<sup>7</sup> We note that we have an open proceeding regarding the service rules for some frequencies within the V-band. See *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands, Implementation of Section 309(j) of the Communications Act – Competitive Bidding, 37.0-38.6 GHz and 38.6-40.0 GHz Bands*, ET Docket No. 95-183 (37 GHz Proceeding).

<sup>8</sup> See *infra* ¶ 55 (discussing the effect of this rulemaking on pending satellite applications).

<sup>9</sup> See *Amendment of Parts 2, 15, and 21 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, Notice of Proposed Rulemaking and Order, FCC 94-273, 9 FCC Rcd 7078 (1994) (*Millimeter Wave Notice*).

<sup>10</sup> See *Millimeter Wave Notice*, 9 FCC Rcd at 7083, ¶ 11.

<sup>11</sup> See *Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40 GHz Band – Implementation of Section 309(j) of the Communications Act*, ET Docket No. 95-183, Notice of Proposed Rulemaking and Order, FCC 95-500, 11 FCC Rcd 4930 (1995) (39 GHz Notice).

<sup>12</sup> *V-band Further Notice*, 16 FCC Rcd at 12246, ¶ 4.

<sup>13</sup> *Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands, Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band, Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services, and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*, IB Docket No. 97-95, Notice of Proposed Rulemaking, FCC 97-85, 12 FCC Rcd 10130 (1997) (*First V-band Notice*).

to the international soft-segmentation sharing arrangement established at WRC-2000.<sup>24</sup> The Commission therefore proposed to designate the entire band from 37.0 – 40.0 GHz for wireless services and from 40.0-42.0 GHz for satellite services.<sup>25</sup>

13. Commenters overwhelmingly support our proposal to redesignate portions of the V-band in a manner consistent with WRC-2000.<sup>26</sup> Intelsat, for example, supports the proposed designation changes, noting that the re-designation would benefit all FSS satellite operators by creating a single two gigahertz contiguous spectrum block, which will greatly simplify spacecraft design.<sup>27</sup> Hughes similarly supports the designation of the 41.0-42.0 GHz band for satellite services,<sup>28</sup> and Winstar states that it “strongly supports the Commission’s efforts to create a band plan for the 36.0–51.4 GHz band and otherwise modify its rules to achieve optimal usage of that spectrum by fixed wireless and satellite providers.”<sup>29</sup> According to Winstar, the Commission’s *V-band Further Notice* correctly follows the results of WRC-2000 and designates the 37.0-40.0 GHz and 42.0-42.5 GHz bands for terrestrial services and the 40.0-42.0 GHz band for satellite.<sup>30</sup>

14. Consistent with the views of the majority of commenters, we redesignate the spectrum available for wireless services from 41.0-42.0 GHz to 37.6-38.6 GHz and redesignate the spectrum available for satellite uses from 37.6-38.6 GHz to 41.0-42.0 GHz. This decision will provide three gigahertz of contiguously designated wireless services spectrum from 37.0-40.0 GHz and two gigahertz of contiguously designated FSS spectrum from 40.0-42.0 GHz. Consolidating the formerly disparate spectrum designations into contiguous bands serves the public interest by permitting increased system capacity, more rapid deployment and reduced operating costs for FS and FSS systems.<sup>31</sup> Increasing the total amount of exclusively designated, contiguous spectrum also will better correspond with the international table of allocations and will maximize the efficient use of the radio frequency spectrum by both satellite and terrestrial users with minimal changes to the existing Table of Frequency Allocations.<sup>32</sup>

15. We are not persuaded by some satellite proponents’ arguments that the Commission should confine wireless designations to the 38.6–40.0 GHz band instead of permitting the FS designation from the 37.6-38.6 GHz band, or delay the implementation of these designations.<sup>33</sup> Boeing, for example, would have us ignore the possibility of FS growth in the V-band band based on its speculation that the

<sup>24</sup> *V-band Further Notice*, 16 FCC Rcd at 12251-52, ¶ 15.

<sup>25</sup> Specifically, the Commission proposed to redesignate the spectrum available for wireless services from 41.0-42.0 GHz to 37.6-38.6 GHz, and to redesignate the spectrum available for satellite uses from 37.6-38.6 GHz to 41.0-42.0 GHz. *V-band Further Notice*, 16 FCC Rcd at 12251, ¶ 15.

<sup>26</sup> See Winstar Comments at 3; DMC Comments at 1; SIA Comments at 2; ART Reply at 2; Bala IV Reply at 2; AT&T Reply at 2, Spectrum Astro Comments at 2; Harris Reply at 2.

<sup>27</sup> Intelsat Comments at 2.

<sup>28</sup> Hughes Comments at 8.

<sup>29</sup> Winstar Comments at 2.

<sup>30</sup> Winstar Comments at 2.

<sup>31</sup> See, e.g., Winstar Comments at 2 (arguing that the new band plan will promote deployment of fixed wireless services); Intelsat Comments at 2, *V-band Further Notice*, 16 FCC Rcd at 12248, ¶ 8.

<sup>32</sup> See *V-band Further Notice*, 16 FCC Rcd at 12250, ¶ 14.

<sup>33</sup> Boeing Comments at 9-10.

40.5-42.5 GHz band for Region 1 (generally Europe, Russia and Africa); (4) established PFD limits in the 40.0-40.5 GHz band for FSS and provisional PFD limits in the 37.5-40.0 GHz and 40.5-42.5 GHz bands for FSS, MSS, and BSS, and, (5) adopted a secondary MSS allocation in Region 2 in the 40.5-41.0 GHz band.<sup>18</sup>

10. Following WRC-2000, the Commission released the *V-band Further Notice* proposing to codify domestically the consensus approach adopted at WRC-2000.<sup>19</sup> NTIA played a key role in formulating the post-WRC-2000 domestic proposals. In the 39.5-40.0 GHz band, NTIA agreed to lower PFD limits and to add a U.S. footnote stating that Government MSS earth stations do not require protection from non-Government fixed and mobile service operations in the 39.5-40.0 GHz band. This proposal was contingent on NTIA's proposal in the 40.5-41.0 GHz band, which allowed military access to the 40.5-41.0 GHz band for FSS and MSS on a primary basis.<sup>20</sup> In May 2001, the Commission further proposed to shift FS, FSS and MSS allocations and to re-designate portions of the 37.5-42.5 GHz spectrum for FS and FSS so as to encourage FS use of the 37.0-40.0 GHz and 42.0-42.5 GHz bands, and a combination of FSS, MSS and BSS in the 40.0-42.0 GHz band. The Commission also proposed to adopt PFD limits consistent with the PFD limits adopted at WRC-2000 and the proposed FS and FSS designations.

11. In July, 2003, WRC-2003 changed some of the footnotes to the International Table of Allocations pertaining to the 37.5-42.5 GHz frequency bands. Some of these changes emphasized the use of high-density applications of the FSS in the 40.0-42.0 GHz and 48.2-50.2 GHz bands (in ITU Region 2).<sup>21</sup> Other footnote changes adopted PFD limits on both FSS and BSS operations, in the 41.0-42.5 GHz band, to protect Radio Astronomy operations at 42.5-43.2 GHz.<sup>22</sup>

### III. DISCUSSION

#### A. Designation Changes

##### 1. Redesignate the 37.6-38.6 GHz and 41.0-42 GHz Satellite and Wireless Services Spectrum

12. WRC-2000 adopted a global plan for sharing between fixed services and satellite services, which imposed a more rigorous satellite PFD limit from 37.0-40.0 GHz favoring terrestrial uses, and a less rigorous PFD limit from 40.0-42.0 GHz favoring satellite uses.<sup>23</sup> In the *V-band Further Notice*, the Commission noted that such a soft-segmentation sharing plan would increase the total amount of exclusively designated, contiguous spectrum available to satellite operators, and would better correspond

<sup>18</sup> *V-band Further Notice*, 16 FCC Rcd at 12249, ¶ 11.

<sup>19</sup> The *V-Band Further Notice* proposed to modify the band plan for the 36.0-51.4 GHz band and proposed specific PFD limits on satellite operations consistent with the results of WRC-2000, and, like the *36-51 GHz Order*, proposed to designate a total of four gigahertz of spectrum for FSS and 5.6 gigahertz of spectrum for wireless services. *V-band Further Notice*, 16 FCC Rcd at 12245, ¶ 1.

<sup>20</sup> See Letter from William T. Hatch, Office of Spectrum Management, NTIA, to Bruce Franca, Office of Engineering and Technology, FCC (March 2, 2001) (NTIA Mar. 2, 2001 *Ex Parte* Letter).

<sup>21</sup> See WRC 2003 Provisional Final Acts 5.516B.

<sup>22</sup> See WRC 2003 Provisional Final Acts 5.551H and 5.551I and Res. 743.

<sup>23</sup> *V-band Further Notice*, 16 FCC Rcd at 12251-52, ¶ 15.

won consensus plan that emerged from WRC-2000, which, in some sense, represents the type of privately negotiated agreement that Boeing endorses for this band. In short, we find that the benefits of the redesignation plan we adopt today — certainty to investors, benefits to wireless and satellite engineering, and compliance with WRC-2000 and WRC-2003 — outweigh the potential inefficiencies that the satellite proponents claims might occur.<sup>42</sup>

17. Finally, while Hughes seeks additional spectrum for ubiquitous FSS operations in the V-band, we decline to provide for such additional spectrum at this time.<sup>43</sup> As noted above, we will not take any action here to undermine the basis of the consensus approach reached at WRC-2000 and any consideration for additional spectrum in the V-band for ubiquitous FSS operations will have to be done in a separate proceeding after a comprehensive record has been developed. We will, however, allow gateway operations<sup>44</sup> in 47.2-48.2 GHz FSS (Earth-to-space) band provided that the earth station downlink operations are also coordinated for use in the 37.5-40.0 GHz band.<sup>45</sup> In addition, satellite entities could bid on licenses in future V-Band auctions, as TRW did in the 38.6-40.0 GHz band.<sup>46</sup>

## 2. Decline to Add MSS Designation to the 40.5-41.0 GHz Band

18. In the *V-band Further Notice*, we proposed to add an MSS designation to the existing FSS and BSS designations in the 40.5-41.0 GHz Band.<sup>47</sup> The Commission reasoned that this designation would allow satellite licensees the maximum flexibility possible in deciding how to use this spectrum. The Commission noted that an MSS designation in the 40.5-41.0 GHz band would be consistent with its proposal to shift the MSS allocation from 39.5-40.0 GHz to 40.5-41.0 GHz.<sup>48</sup>

19. While a few commenters support the proposal to add an MSS designation to the 40.5-41.0 GHz band,<sup>49</sup> most parties oppose the proposal as inconsistent with the designation of the 40.0-42.0 GHz band for FSS. Intelsat, for example, opposes an MSS designation in the 40.5-41.0 GHz band because adding MSS would result in the over-crowding of multiple services and applications in the 40.0-42.0 GHz band.<sup>50</sup> Other commenters, such as PanAmSat and TRW, assert that FSS and MSS systems are

---

<sup>42</sup> See, e.g., Intelsat Comments at 2 (redesignation would benefit FSS satellite operators and simplify spacecraft design)

<sup>43</sup> Hughes Comments at 2-3; Hughes Reply at 1-5.

<sup>44</sup> See Section 25.202, n 15

<sup>45</sup> See discussion *infra* Section III.A.5.

<sup>46</sup> See *In the Matter of TRW, Inc. Request for Waiver of the Commissions Rules to Provide Fixed Satellite Service in the 39 GHz Band*, Memorandum Opinion and Order, 16 FCC Rcd 5198 (Wireless Tel. Bur. 2001) (*TRW Waiver Order*). We note that the Commission adopted the *TRW Waiver Order* prior to the passage of the ORBIT Act, 47 U.S.C. § 761 *et seq.*

<sup>47</sup> *V-band Further Notice*, 16 FCC Rcd at 12252, ¶ 16.

<sup>48</sup> *V-band Further Notice*, 16 FCC Rcd at 12253-54, ¶¶ 23-25.

<sup>49</sup> Winstar Comments at 4; NTIA Comments at 1.

<sup>50</sup> Intelsat Comments at 2

needs of the FSS systems or some as-yet unknown operator would outweigh the needs of previously licensed FS operators. Specifically, Boeing asserts that terrestrial FS has not yet deployed in sufficient numbers to warrant an extension of the FS designation to the 37.6-38.0 GHz band.<sup>34</sup> We disagree. While terrestrial FS operations in the V-band are not yet extensive, satellite operations in the band have not yet been licensed. In any case, the regulatory certainty gained by both FS and FSS operators outweighs Boeing's conjecture that designating additional spectrum at this time "would foreclose other important alternatives that the Commission may wish to pursue at a later date when the public's needs are much clearer."<sup>35</sup> As noted above, moreover, this redesignation should promote investment and development throughout the V-band.<sup>36</sup>

16. A few satellite operators assert that the 37.6-38.6 GHz band should be allocated for FSS or, alternatively, remain undesignated.<sup>37</sup> Boeing, for example, reasons that the propagation characteristics of the 37.6-38.6 GHz band, which require line-of-sight and a large number of base stations,<sup>38</sup> make it unsuitable for a wireless services designation.<sup>39</sup> Boeing adds that private coordination among the terrestrial and satellite operators might result in sharing arrangements superior to the consensus agreement reached at WRC-2000.<sup>40</sup> We disagree. First, Winstar – an FS licensee – is on record as stating that the propagation characteristics of this band are, in fact, well suited to FS operations.<sup>41</sup> Second, FS and FSS proponents tried, and failed, to coordinate operations in the V-band for many years. This proceeding and, more importantly, the consensus agreement that these parties reached at WRC-2000 represents the culmination of those many years of private negotiation among FS and FSS interests. While we support and encourage parties to enter private sharing arrangements wherever co-primary allocations exist, we believe the consensus agreement reached among these parties and the Government prior to WRC-2000 represents a better method of promoting timely and cost-effective deployment in this band than returning to a series of negotiations among each of the parties in this band. Third, designating the 37.6-38.6 GHz band for terrestrial FS represents a key piece of the near universal agreement among both FS and FSS proponents at WRC-2000 that generally envisioned most terrestrial operations below 40 GHz and most satellite operations above 40 GHz. If we were to accede to Boeing's recommendation and undo one piece of that agreement in a manner that favored FSS interests, we would risk thwarting the hard-

---

<sup>34</sup> Boeing Comments at 9.

<sup>35</sup> Boeing Comments at 9-10.

<sup>36</sup> Because we are designating the 37.6-38.6 GHz sub-band, we need not address Boeing's argument that the Commission should target instead the 42.5-43.5 GHz sub-band for any demonstrated need for future fixed service expansion. See Boeing Comments at 10.

<sup>37</sup> Boeing Comments at 11, 10-11; Hughes Comments at 8.

<sup>38</sup> According to Boeing, assuming a maximum possible 78.5 square mile service area for each base station in a wireless network, at least 7,400 base stations would be required to cover the metropolitan areas of the United States. Assuming a price of \$625,000 per base station, the cost to set up even a minimum required wireless infrastructure to serve all Metropolitan Statistical Areas (MSAs) would amount to \$4.6 billion dollars, not including customer equipment costs. Rural Service Areas in the United States (distinct from MSAs) cover a total of approximately 3 million square miles. Coverage of these areas would require approximately 38,000 base stations at a total cost of about \$23.8 billion dollars. Because of these costs, Boeing claims that it is likely that FS will be able to serve only a small portion of the United States using the 37.6-38.6 GHz band. See Boeing Comments at 12-13.

<sup>39</sup> Boeing Comments at 11-13.

<sup>40</sup> Boeing Comments at 14.

<sup>41</sup> Winstar Comments at 1-3.



band. The additional complication associated with MSS operations further persuades against adopting a designation for MSS in this band consistent with the outcome of WRC-2000 for Region 2. The U.S. proposal to WRC-2000 was to allocate MSS on a co-primary basis in the 40.5-41.0 GHz band to accommodate Government uses. The U.S., however, failed to secure a global, primary MSS allocation.<sup>58</sup> We therefore allocate MSS in the 40.5-41.0 GHz band on a secondary basis only.<sup>59</sup> Adopting MSS on a secondary basis will permit satellite operators to test those MSS applications that utilize higher gain user-antennas and, therefore, might be capable of sharing with FSS and BSS systems without interfering with the primary services.

### 3. Modify Part 25 and Part 101 Rules to Reflect New Designations

22. In the *V-band Further Notice*, we proposed to amend Part 25 of our rules concerning fixed-satellite service to remain consistent with our proposals for revised designation.<sup>60</sup> In addition, we proposed to amend Part 101 of our rules concerning fixed microwave services to correct the erroneous omission of FSS from the list of services that we permit in the 38.6-40.0 GHz band.<sup>61</sup> Commenters generally support our decision to modify the Part 25 and Part 101 rules to reflect the new designations. Winstar supports the Commission's proposal.<sup>62</sup> Similarly, TRW agrees that Parts 25 and Part 101 of our rules should be modified.<sup>63</sup> As indicated in Appendix B, we amend Parts 25 and 101 of our rules largely as proposed in the Notice.

### 4. PFD Limits

23. In the *V-band Further Notice*, the Commission proposed to adopt band-specific PFD limits as a means of implementing the designations described above. In particular, the Commission's proposal was based on the soft-segmentation approach whereby the satellite PFD limits would differ below and above 40 GHz, consistent with Article 21 and Resolution 84 of the Final Acts of WRC-2000 and the U.S./CITEL proposal.<sup>64</sup> Such an approach would primarily accommodate high-density fixed service systems in the 37.5-40.0 GHz band, with some provision for large gateway satellite earth stations, while primarily accommodating high-density fixed-satellite service systems in the 40.0-42.0 GHz band. The Commission proposed to implement this approach by having clear-sky PFD limits below 40 GHz 12 dB lower than those above 40 GHz. The Commission reasoned that this difference in PFD limits would favor the deployment of FS below 40 GHz and FSS above 40 GHz.<sup>65</sup> While WRC-2003 retained some

<sup>58</sup> See International Telecommunications Union, Radio Regulations, Article 5.

<sup>59</sup> See *infra* III B.2

<sup>60</sup> *V-band Further Notice*, 16 FCC Rcd at 12252, ¶ 17.

<sup>61</sup> *V-band Further Notice*, 16 FCC Rcd at 12252, ¶ 17.

<sup>62</sup> Winstar Comments at 4.

<sup>63</sup> TRW Comments at 19.

<sup>64</sup> *V-band Further Notice*, 16 FCC Rcd at 12257-58, ¶ 35

<sup>65</sup> *V-band Further Notice*, 16 FCC Rcd at 12259, ¶ 40. In May 2002, the Commission entered into an Arrangement with Industry Canada, which "reaffirms the band segmentation approach proposed by the Commission after WRC-2000 that identifies spectrum below 40 GHz primarily for high density fixed service use as well as spectrum between 40 and 42 GHz primarily for high density fixed-satellite service operations." See *FCC and Industry Canada Sign Arrangement on Principles Governing Use on 37.5-42.5 GHz Band*, FCC Press Release, dated May 28, 2002.

technically incompatible on a co-primary basis.<sup>51</sup> Nevertheless, both PanAmSat and TRW would support a secondary non-government MSS allocation in the 40.5-41.0 GHz band.<sup>52</sup>

20. We decline to adopt our proposal to add a designation for MSS in the 40.5 -41.0 GHz band. Unlike allocations, no "primary" or "secondary" designations exist; instead, either we designate spectrum for a service or we do not.<sup>53</sup> Spectrum designations for a particular service do not necessarily preclude other technically dissimilar services from operating in a given band, provided that the dissimilar service can meet the technical constraints imposed by the service and licensing rules.<sup>54</sup> We use designations to indicate, based on a series of operational and technical constraints, the service type that we believe should principally occupy a band that is allocated among multiple services of the same regulatory status. For example, as between the two co-primary services, FS and FSS, in the 37.0-40.0 GHz band, we designated the band for terrestrial wireless services such as FS, because we determined that the terrestrial FS should predominate in this band.<sup>55</sup> A designation of more than one technically dissimilar service in a given band is impractical because, by definition, only one service type could predominate in the band due to operational characteristics.<sup>56</sup> Hence, a designation is not appropriate for a secondary service. In this case, if we were to designate the 40.5-41.0 GHz band for MSS, we would either relegate the existing designated service—FSS—to something less than predominant status, or we would render the very use of "designations" meaningless by requiring FSS and MSS to coordinate on an entirely co-equal basis. As an alternative to adopting an additional MSS designation, therefore, we create a secondary allocation for MSS in the 40.5 - 41.0 GHz band. The secondary allocation for MSS is discussed in detail below.<sup>57</sup>

21. We question whether an MSS system could feasibly be operated in the same bands designated for FSS and BSS, because an MSS system would likely receive interference from FSS and BSS services under normal conditions. Even though there is a PFD limit for the shared allocation, the GSO (or a portion of the GSO) could be "packed" with FSS and BSS satellites. FSS and BSS systems are designed with fixed, directional antennas that point to a specific satellite to transmit and receive signals from space. Many MSS applications, particularly in the lower frequency bands, by comparison, use omni-directional antennas that do not point to a specific satellite. These omni-directional antennas are necessary because the handsets are, in general, mobile. The MSS receivers will "see" several transmitting satellites at once, however, because the MSS earth station antenna does not have a high directional antenna. The directional gain of FSS and BSS antennas, by contrast, minimizes the potential for receiving interference from other nearby FSS and BSS satellites due to the rapid decrease in antenna gain as the angle from the wanted satellite increases. MSS omni-directional antennas do not have this rapid gain roll-off pattern and, as a result, MSS, generally, has a greater potential to receive interference from other nearby satellites even when a PFD limit has been established for the FSS and BSS in the same

<sup>51</sup> PanAmSat Reply at 4; TRW Comments at 8.

<sup>52</sup> PanAmSat Reply at 4; TRW Comments at 8.

<sup>53</sup> See *V-band Further Notice*, 16 FCC Rcd at 12247 n.17.

<sup>54</sup> See *V-band Further Notice*, 16 FCC Rcd at 12247 n.17.

<sup>55</sup> See *supra* Section III A.1.

<sup>56</sup> Designations, in other words, may apply to only technically similar services within the same band. For example, FSS and BSS, in which satellites transmit to fixed earth stations under similar power and operational constraints, are technically similar services. Their similarities allowed the Commission to designate both services as the principal service type in portions of the V-band over the technically dissimilar co-primary service of FS.

<sup>57</sup> See *infra* Section III B.2 As a secondary service in this band, MSS must not cause interference to and must accept interference from the primary FSS, BSS and FS services.

during normal operations, *i.e.*, when there is no rain fading and the upper bound PFD that will apply during fade conditions. The ITU Radio Regulations already provide the upper bound that will apply to satellite operations. Moreover, we see no need to distinguish between the “top-down” and “bottom-up” approaches discussed above. In the end, both approaches to specifying PFD limits will have identical effects on satellite operations.<sup>73</sup> Both would require satellite operators to operate at the same PFD limit for clear sky conditions, while allowing satellite operators to operate at the same higher PFD limit during fade conditions. Thus, satellite providers must adhere to the same PFD limits, regardless of whether clear-sky or rain fade conditions dictate the standard operating PFD limit. Accordingly, we find that there is no meaningful difference between the “top-down” and “bottom-up” approaches described above.<sup>74</sup>

28. In the *V-Band Further Notice*, we requested commenters to address the issue of under what circumstances and for what period of time to permit FSS operators to exceed the lower PFD limit in the 37.5-40.0 GHz band, especially during times when there is large attenuation of the satellite signal due to rain. We find that the record in this proceeding is not sufficiently detailed for us to adopt rules for satellite operations with a PFD exceeding the lower PFD limit in the 37.5-40.0 GHz band. This does not mean, however, that we cannot support the basic PFD values that we proposed to apply to soft-segmentation. Until we have a better record or a more reasoned and comprehensive approach on dealing with an increase in PFD for a limited amount of time, we will incorporate only the lower and upper boundary PFD limits that are ripe for adoption. We will address this issue in a future rulemaking to establish a better record to determine the conditions under which the lower PFD limit may be exceeded.

29. We continue to recognize that rain fading has a significant impact on radio propagation at 40 GHz and that PFD increases and other ameliorating techniques will be necessary to maintain adequate satellite performance even to the limited extent provided for in the 37.5-40.0 GHz band. The conditions under which geostationary satellites may exceed the lower boundary PFD limits are still being considered by the Commission. Even though the upper PFD boundary is being implemented in the rules, any request to exceed the lower boundary would be addressed on a case-by-case basis and subject to the review and coordination of both the International Bureau and the Wireless Telecommunications Bureau to ensure that the proper sharing conditions exist between the satellite and terrestrial stations. Our disposition of such requests will be subject to the outcome of the future rulemaking, addressing the FSS service rules in the V-band, which will establish specific criteria for exceeding the lower boundary. Nevertheless, terrestrial licensees, when deploying stations in the 37.5-40.0 GHz band, should take into account the possibility of satellite operations for some limited period of time up to the maximum PFD contained in Section 25.208. Moreover, the PFD limits we adopt for NGSO FSS are provisional in that the conditions under which non-geostationary satellites may share with geostationary satellites are still being considered by the Commission. Resolution of the GSO/NGSO satellite sharing rules could result in additional changes to Section 25.208. In addition to this issue, we intend to address in our future proceeding all additional issues raised in the *V-Band Further Notice* but not included in this Order, including out-of-band emission limits to protect RAS above 42.5 GHz, additional NGSO FSS and GSO FSS constraints to promote inter-satellite system sharing, and proposed rules to coordinate certain types of earth stations

(Continued from previous page)

3, Hughes Comments at 10-11. WRC-2003 has now concluded, and nothing that occurred at this WRC has persuaded us against implementing soft segmentation.

<sup>73</sup> WRC-2003 Article 21, Table 21.4.

<sup>74</sup> For example, a “bottom-up” rule establishing a PFD limit of  $-132 \text{ dB}/(\text{W}/\text{m}^2)$  under clear sky conditions, but permitting satellite operators to increase power by 12 dB (to a level of  $-120 \text{ dB}/(\text{W}/\text{m}^2)$ ) under fade conditions is operationally identical to a “top-down” rule establishing a PFD limit of  $-120 \text{ dB}/(\text{W}/\text{m}^2)$  under fade conditions, but requiring licensees to decrease their power by 12 dB (to a level of  $-132 \text{ dB}/(\text{W}/\text{m}^2)$ ) under clear sky conditions. Under both scenarios, operators face a PFD limit of  $-132 \text{ dB}/(\text{W}/\text{m}^2)$  under clear sky conditions and of  $-120 \text{ dB}/(\text{W}/\text{m}^2)$  under fade conditions.

aspects of the soft-segmentation approach, we find that the soft-segmentation approach is still important for the development of both the FS and FSS in the V-band. We, therefore, will implement PFD limits that favor the FS below 40 GHz and the FSS above 40 GHz.

24. Consistent with our proposed band designations in the 37.5-42.5 GHz band, we conclude that adopting the PFD limits supporting the soft-segmentation approach would enhance and promote commercial development of both satellite and wireless services in this band. As we explained in the *V-band Further Notice*, we find that U.S. terrestrial wireless licensees, which operate systems today and plan to deploy additional systems in the near future, would benefit from the certainty of knowing the precise PFD limits that will apply in the United States. Similarly, we find that satellite operators, whose systems require more time to build than terrestrial operators, would benefit from knowing the parameters that they will need to observe in the United States when constructing their global systems. Accordingly, we adopt PFD limits in the 37.5-42.0 GHz bands that provide both satellite and wireless operators an added level of certainty concerning the potential impact by the other service on their operations. These PFD limits also support "soft-segmentation" and designations of separate FS and FSS spectrum. The only outstanding issues are how to implement PFD limits under varying propagation conditions in the 37.5-40.0 GHz band, and how to protect the Radio Astronomy Service (RAS) observations in the 42.5-43.5 GHz band from satellite operations in the 42.0-42.5 GHz band. The PFD levels we adopt for the 37.5-42.0 GHz bands are contained in Section 25.208.

25. Several commenters support the WRC-2000 "top-down" approach, which establishes relatively high PFD limits for fade conditions and relied on licensees to decrease their PFD to account for normal operating conditions.<sup>66</sup> TRW, for example, notes that, since the WRC-2000, the US has firmly backed the WRC-methodology in the ITU-R.<sup>67</sup> TRW therefore alleges that adopting the US/CITEL "bottom-up" approach "will likely cause confusion and compound already substantial international resentment to the clear-sky PFD elements."<sup>68</sup> PanAmSat similarly finds that adopting a standard contrary to the WRC-2000 approach "will create confusion and add to international unhappiness with the clear-sky PFD components" of the band plan.<sup>69</sup>

26. In contrast to WRC-2000's "top-down" approach, the U.S./CITEL approach established lower PFD limits for normal operating conditions and, where applicable, allows licensees to increase power to compensate for fade conditions.<sup>70</sup> Winstar, for example, claims that the WRC-2000 approach will place the burden on HDFS operators to police the FSS operators to make sure the FSS is operating at the lower PFD levels; on the other hand, Winstar argues that the US/CITEL approach "will reasonably shift the burden to FSS operators to be diligent about when and how they operate at higher power levels."<sup>71</sup>

27. Upon review, we find that our rules should reflect at this time the PFD limits that define the boundaries of the soft-segmentation.<sup>72</sup> To this end, we incorporate in our rules the PFD levels that apply

<sup>66</sup> *V-Band Further Notice*, 16 FCC Rcd at 12258, ¶ 38.

<sup>67</sup> TRW Comments at 21

<sup>68</sup> TRW Comments at 21.

<sup>69</sup> PanAmSat Reply at 2

<sup>70</sup> *V-Band Further Notice*, 16 FCC Rcd at 12258, ¶¶ 36-37.

<sup>71</sup> Winstar Comments at 7

<sup>72</sup> Several parties suggest we defer adopting the provisional WRC-2000 PFD limits until after the Commission addresses service and licensing rules for these bands and the conclusion of WRC-2003. See Intelsat Comments at (continued ...)

areas where FS/FSS sharing considerations and coordination would be required. We also note that the deployment of non-protected earth stations at the sole risk of a satellite operator will not hinder the deployment of the ubiquitous fixed service terminals and that the satellite operator will need the express agreement from the affected Part 101 EA licensees prior to the deployment of the earth stations. Therefore we adopt limitations on the types of earth stations that may be licensed in the 37.5-40.0 GHz band and limit the type of earth station that will receive interference protection from the fixed terminals.

33 In the *V-band Further Notice* we used the text of the footnote to Part 25.202(a)(1) to describe the type of FSS earth terminal we would consider licensing in bands designated for ubiquitous fixed service deployment.<sup>82</sup> A number of commenters indicated that our proposal to prohibit facilities that serve individual customers was unclear or overly restrictive.<sup>83</sup> Others urged the Commission to adopt the gateway definition contained in the *V-Band Further Notice*.<sup>84</sup> Moreover, WCA asserted that the gateway definition in the *V-Band Further Notice* was not sufficiently restrictive<sup>85</sup> and that a limit on the number of gateway stations constructed by any single FSS operator should be enacted.<sup>86</sup> We conclude that the proposed footnote language strikes the proper balance between the wireless designation and the limited FSS use of the 37.5-40.0 GHz band and that it will help to foster the soft-segmentation compromise. We therefore adopt our proposed gateway earth station description, as proposed in the *V-Band Further Notice*, as a footnote to 25.202(a)(1).<sup>87</sup> The footnote states: "Satellite earth station facilities in this band may not be ubiquitously deployed and may not be used to serve individual consumers." We will address, in a future rulemaking, the specific conditions that will require coordination among gateway earth stations and terrestrial earth stations.

## **B. Allocation Changes**

### **1. Add FSS Allocation in the 37.5-37.6 GHz Band**

34. In the *V-band Further Notice*, the Commission proposed to add an additional 100 megahertz FSS allocation in the 37.5-37.6 GHz band.<sup>88</sup> As a part of the compromise plan arising from WRC-2000, the Commission proposed to allow limited FSS use of the entire 37.5-40.0 GHz band. In the current Table of Allocations, however, only the 37.6-40.0 GHz band includes a co-primary FSS allocation, and the 100 megahertz between 37.5-37.6 GHz is allocated exclusively to fixed and mobile service.<sup>89</sup> In the *V-band Further Notice*, the Commission proposed completing the FSS allocation for the entire 37.5-40.0

---

<sup>82</sup> See Appendix B, Proposed Part 25.202 (a)(1)(14) of the *V-Band Further Notice* ("Use of this band by the fixed-satellite service is limited to "gateway" earth station operations, provided the licensee under this Part obtains a license under Part 101 of this Chapter or an agreement from a Part 101 licensee for the area in which an earth station is to be located. Satellite earth station facilities in this band may not be ubiquitously deployed and may not be used to serve individual consumers.")

<sup>83</sup> See TRW Comments at 26, Hughes Reply at 18.

<sup>84</sup> See WCA Reply at 4, DCT Transmission Reply at 3, Harris Corporation Reply at 3.

<sup>85</sup> WCA Reply, Appendix A, at 1

<sup>86</sup> WCA Comments at 7

<sup>87</sup> See *V-band Further Notice*, 16 FCC Rcd at 12261, ¶47.

<sup>88</sup> See *V-band Further Notice*, 16 FCC Rcd at 12252, ¶ 19.

<sup>89</sup> 47 C.F.R. § 2.106 (2002). Moreover, the 37.0-38.6 GHz band is allocated to Government fixed and mobile services and the 37.0-38.0 GHz band is allocated to Government Space Research Service (SRS).

operating in the V-band spectrum.<sup>75</sup> Accordingly, we adopt the PFD limits contained in Appendix B, Section 25.208, recognizing that we will address these additional PFD-related issues in the future.

## 5. Gateway Earth Stations

30. In the *V-band Further Notice*, the Commission proposed to restrict FSS use in the 37.5-40.0 GHz band to “gateway” earth station operations because such a restriction would help preserve the proposed designation for use by wireless services. Permitting satellite “gateways” to be deployed at large installations or large corporate campuses without generating the types of ubiquitous, consumer-level deployments, would not defeat the designation of wireless services as the predominant use in this band. Specifically, the Commission proposed to limit the satellite earth station operations that a Part 101 licensee may deploy in its licensed area in the 37.5-40.0 GHz band to “gateway” facilities<sup>76</sup> and to restrict the use of gateway facilities by modifying Section 25.202(a)(1) to state that “satellite earth station facilities in this band may not be ubiquitously deployed and may not be used to serve individual consumers.”<sup>77</sup> The Commission requested comment on whether limiting the flexibility of Part 101 licensees in this band is appropriate. The Commission also sought comment on its proposals to limit the 37.5-40.0 GHz band to use by satellite earth station gateways and on the specific language proposed to restrict the “gateway” terminals.

31. TRW is the only commenter that explicitly recognizes the need to sacrifice a measure of Part 101 flexibility in order to preserve the proposed designation of the 37.5-40.0 GHz band for use by wireless services.<sup>78</sup> Comments on limiting the satellite use of the 37.5-40.0 GHz band to gateway terminals and on the specific language proposed to restrict the “gateway” terminals were more numerous. Since these comments address the manner in which such limitations of flexibility would be implemented we conclude that it is in the public interest to balance Part 101 flexibility for satellite earth stations in order to preserve the designation to the fixed service in the 37.5-40.0 GHz band.

32. TRW and Winstar, among others, agree with us that the soft segmentation compromise is further strengthened by prohibiting ubiquitous deployment of FSS earth stations in the 37.5-40.0 GHz band.<sup>79</sup> Hughes argues that limitations on the type of FSS earth station should be restricted to the 38.6-40.0 GHz band,<sup>80</sup> while Intelsat argues that non-gateway earth stations should be allowed on a non-protected basis.<sup>81</sup> We agree with TRW and Winstar that the soft-segmentation compromise requires that we ensure that FSS terminals are not ubiquitously deployed in 37.5-40.0 GHz band. We therefore conclude that some type of restriction should be placed upon the type of Earth station that will receive protection from interference in the 37.5-40.0 GHz band. These restrictions are necessary to minimize the

---

<sup>75</sup> The PFD limits adopted are different for GSO FSS and NGSO FSS systems. These PFD limits are provisional in that the conditions under which NGSO satellites may share with GSO satellites are under study and therefore have not been defined. Resolution of the NGSO/GSO satellite sharing rules could result in additional changes to Section 25.208.

<sup>76</sup> *V-band Further Notice*, 16 FCC Rcd at 12261, ¶ 46.

<sup>77</sup> *V-band Further Notice*, 16 FCC Rcd at 12271, ¶ 47.

<sup>78</sup> TRW Comments at 26.

<sup>79</sup> TRW Comments at 26, Winstar Reply at 4, FWCC Reply at 4, DCT Transrussion at 3, DMC Stratex Networks Comments at 2.

<sup>80</sup> Hughes Comments at 12.

<sup>81</sup> Intelsat Comments at 9.

37 In addition, we will not limit this new FSS allocation to GSO FSS. Ordinarily we would permit both GSO and NGSO FSS use of the newly allocated FSS frequencies at 37.5-37.6 GHz, as the Commission's policy is not to distinguish between GSO and NGSO systems in the absence of a compelling reason to do so. In the *V-band Further Notice*, the Commission noted NTIA's concern that current and intended Government uses of the 37.5-37.6 band would be more susceptible to interference from NGSO FSS than GSO FSS satellites.<sup>98</sup> In its comments to this proceeding, NTIA reiterated that it preferred not to have an FSS allocation overlap the space research allocation at 37.0-38.0 GHz.<sup>99</sup> NTIA maintained that FSS use of the 37.5-37.6 band should be restricted to GSO FSS only and should incorporate adequate protections for the National Aeronautics and Space Administration (NASA) earth stations in Goldstone, CA and the orbital VLBI site at Green Bank, WV.<sup>100</sup> The Commission sought comment on whether the intended Government uses of the band were more susceptible to interference from NGSO FSS systems than GSO FSS systems and, if so, whether NGSO FSS operations in the band should be prohibited. The Commission also sought comment on what technical or operational constraints, short of a prohibition on NGSO FSS operations in the band, would provide sufficient protection to Government operations in the band.<sup>101</sup> The Commission noted that, under certain conditions, certain deployments of NGSO FSS systems can create a promising sharing environment for FS operators and are capable of addressing NTIA's concerns.<sup>102</sup>

38. In response, some commenters assert that the Commission should not exclude NGSO systems from the proposed FSS allocation.<sup>103</sup> These commenters argue that NTIA did not sufficiently demonstrate its specific rationale for excluding NGSO FSS systems from the 37.5-37.6 GHz band and therefore future NGSO FSS use of this band should not be precluded.<sup>104</sup> Boeing adds that the Commission has "consistently refrained from dividing the 36-51 GHz band between NGSO and GSO technologies."<sup>105</sup> In a subsequent filing, NTIA supported its position that both the Goldstone, CA facility and the orbital VLBI site at Green Bank, WV should receive specific protections from NGSO FSS systems operating in the 37.5-37.6 GHz band.<sup>106</sup> NTIA cites an international commitment, embodied in ITU-R SA.1396, to protect space research operations like the Goldstone facility.<sup>107</sup> This Recommendation sets forth the specific protection criteria for space research services in the 37-38 GHz

<sup>98</sup> See *V-band Further Notice*, 16 FCC Rcd at 12253, ¶ 21.

<sup>99</sup> See Letter from William T. Hatch, Office of Spectrum Management, NTIA, to Bruce Franca, Office of Engineering and Technology, FCC (Aug. 31, 2001) (NTIA Aug. 31, 2001 *Ex Parte* Letter) at 1.

<sup>100</sup> NTIA Aug. 31, 2001 *Ex Parte* Letter at 2. NTIA argues that to support current and future NASA missions these earth stations would require protection against harmful interference in the 37.5-38.0 GHz band. Specifically they would require a power spectral density level of -217 dB(W/Hz), not to be exceeded for more than 0.1% of time. NTIA later rescinded the request for protection to the Orbital VLBI site at Green Bank, WV in the 37.0-38.0 GHz band. *Id*

<sup>101</sup> See *V-band Further Notice*, 16 FCC Rcd at 12253, ¶ 21.

<sup>102</sup> See *V-band Further Notice*, 16 FCC Rcd at 12253, ¶ 21.

<sup>103</sup> See SIA Comments at 2; Boeing Comments at 15.

<sup>104</sup> SIA Comments at 2; Boeing Comments at 15-16

<sup>105</sup> Boeing Comments at 15.

<sup>106</sup> NTIA Aug. 31, 2001 *Ex Parte* Letter.

<sup>107</sup> See ITU-R S.A. 1396, "Protection Criteria for the Space Research Service in the 37-38 and 40-40.5 GHz Bands" (adopted April 1999).

GHz band and noted that adding a co-primary FSS allocation in the 37.5-37.6 GHz band would remain consistent with the designation of the entire 37.5-40.0 GHz band principally for fixed services.

35. The record supports adding a co-primary FSS allocation in the 37.5-37.6 GHz band.<sup>90</sup> Boeing states that the demand for satellite services warrants an FSS allocation at 37.5-37.6 GHz.<sup>91</sup> Intelsat also supports the Commission's proposal as the 100 megahertz of spectrum would provide additional capacity for the FSS generally, and could be utilized for "mitigation techniques to compensate for rain and other fades."<sup>92</sup> Spectrum Astro and TRW add that a continuous FSS allocation in the 37.5-40.0 GHz band would be consistent with the WRC-2000 soft segmentation plan and would promote flexibility in the deployment of future FSS systems.<sup>93</sup> Hughes also notes FSS deployment in this band can facilitate the provision of "broadband services to a wide range of end-users."<sup>94</sup> Non-Government FS proponents licensed in the 37.5-40.0 GHz band do not object to an FSS allocation in the 37.5-37.6 band, provided FSS use of this 100 megahertz of spectrum is "sufficiently limited" to protect current and future FS deployments.<sup>95</sup> NTIA indicated that any FSS use of the 37.5-37.6 GHz spectrum should be limited to GSO FSS use because the space research service would share better with GSO FSS than with NGSO FSS. Moreover, NTIA would prefer that FSS use of the 37.5-37.6 GHz band be limited to FSS gateways.<sup>96</sup>

36. Adding an additional 100 megahertz FSS allocation in the 37.5-37.6 GHz band will serve the public interest. As indicated above, allocating an additional 100 megahertz for FSS, subject to the same limitations on FSS as the other V-band frequencies that we have designated for terrestrial FS, will increase the spectrum efficiency in the band. With the PFD limits we adopt in this *Order*, we believe that FSS operations are capable of sharing with terrestrial operations (commercial and Government) in this band without creating undue technical burdens on either the terrestrial or space research services. Approving the allocation of FSS operations in this band will facilitate greater access to and higher utilization of the spectrum at 37 GHz. We also note that this additional 100 megahertz FSS allocation would bring the U.S. Table of Frequency Allocations into alignment with both the WRC-2000 soft segmentation plan and Article 5 of the ITU Radio Regulations.<sup>97</sup>

---

<sup>90</sup> See TRW Comments at 6-7; SIA Comments at 2; Boeing Comments at 15; Hughes Comments at 8, Spectrum Astro Comments at 2; Intelsat Comments at 3; Winstar Reply at 6.

<sup>91</sup> Boeing Comments at 11, 15. Boeing also notes that the Commission's proposal is consistent with its contention that all wireless service designations should be withdrawn from the sub-bands below 38.6 GHz. See Boeing Comments at 15.

<sup>92</sup> Intelsat Comments at 3.

<sup>93</sup> See Spectrum Astro Comments at 2, TRW Comments at 7. TRW notes that the Commission has recognized that even though this band is designated for wireless operations, certain deployments of FSS earth stations are capable of sharing this band with fixed wireless system, including Winstar's proposed High-density Fixed Services (HDFS) system, which is "extremely sensitive to interference." *Id.* (citing *V-band Further Notice* 16 FCC Rcd at 12253, ¶ 21).

<sup>94</sup> See Hughes Reply at 111. Hughes argues that these deployments will be successful so long as there are no "limitations or restrictions on the deployment of earth terminals [that] could render it unusable." Hughes Reply at 9.

<sup>95</sup> Winstar Reply at 6; FWCC Reply at 4; Bala Equity IV Reply at 4; AT&T Reply at 2, 4.

<sup>96</sup> NTIA March 2, 2001 *Ex Parte* Letter.

<sup>97</sup> See International Telecommunication Union, Radio Regulations, Article 5, *see also* Intelsat Comments at 3.



and mobile systems operating in the wireless designation will have the potential to interfere with the Goldstone SRS facility. We will seek comment on methods to mitigate the potential interference that may be caused by commercial fixed and mobile stations operating near the Goldstone SRS facility in the 37 GHz Proceeding.<sup>114</sup> Among the possibilities we will seek comment on would be to adopt a footnote to the Table of Allocations modeled after Footnote US311, already contained in the Table of Allocations. Footnote US311 establishes a 80 km (50 mile) radius around the Goldstone SRS facility in which every practicable effort is made to avoid the assignment of frequencies in the 1350-1400 MHz and 4950-4990 MHz bands to stations operating in the fixed and mobile services.<sup>115</sup>

## 2. Shift MSS Allocation from 39.5-40.0 GHz to 40.5-41.0 GHz

42. In the *V-band Further Notice*, the Commission proposed to shift the 39.5-40.0 GHz MSS allocation to the 40.5-41.0 GHz band.<sup>116</sup> The 39.5-40.0 GHz band is currently allocated to the FS, MS, FSS, and MSS services on a co-primary basis; however, in the *36-51 GHz Order*, the Commission concluded that ubiquitous satellite uses could not share the same spectrum as ubiquitous terrestrial uses.<sup>117</sup> Indeed, prior to WRC-2000, NTIA agreed to support the U.S. proposals to the WRC-2000, which required constraints to be placed on the Government 39.5-40.0 GHz MSS allocation in return for access to the 40.0-41.0 GHz spectrum under the "soft-segmentation" arrangement.<sup>118</sup> The Commission affirmed its conclusion regarding sharing between ubiquitously deployed services in the *V-band Further Notice*, and commenters addressing the issue of co-frequency sharing in the 39.5-40.0 GHz band support our analysis.<sup>119</sup> Accordingly, while we will continue to permit FSS gateways to operate in the 39.5-40.0 GHz band, we conclude that ubiquitously deployed MSS stations cannot share with ubiquitous terrestrial uses in the 39.5-40.0 GHz band. Therefore, we delete the MSS allocation from the non-Government column of the Table of Frequency Allocations contained in Section 2.106 of the Commission's Rules and add US382 to the Table whereby Government earth stations operating in the 39.5-40.0 GHz MSS allocation shall not claim protection from non-federal Government stations in the fixed and mobile services.<sup>120</sup>

43. For consistency, we would normally propose to delete the MSS allocation in this band from the Government column. NTIA, however, opposes this measure.<sup>121</sup> NTIA states that arrangements with member states of the North Atlantic Treaty Organization (NATO) require that we retain the Government

---

<sup>114</sup> See 37 GHz Proceeding.

<sup>115</sup> 47 C.F.R. § 2.106 n.US311 (2002).

<sup>116</sup> *V-band Further Notice*, 16 FCC Rcd at 12253-54, ¶ 22.

<sup>117</sup> See 36-51 GHz Order, 13 FCC Rcd 24649.

<sup>118</sup> We note that there exists a co-primary Government Earth Exploration Satellite Service (EESS)(Earth-to-space), Space Research Service (SRS) (Earth-to-space), and secondary EESS allocation in the 40.0-40.5 GHz band. See 47 C.F.R. § 2.106 (2002).

<sup>119</sup> See Winstar Comments at 4.

<sup>120</sup> See Appendix B, § 2.106, US382.

<sup>121</sup> See Letter from Richard D. Parlow, Office of Spectrum Management, NTIA, to Richard Smith, Office of Engineering and Technology, FCC (April 30, 1997), available at <[http://haisfoss.fcc.gov/prod/ecfs/retrieve.cgi?native\\_or\\_pdf=pdf&id\\_document=1831190001](http://haisfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=1831190001)> (last visited, Feb. 23, 2003).

band and was adopted by the ITU in an effort to protect both general space research operations as well as unique operations during mission critical events.<sup>108</sup>

39. Taking NTIA's concerns into consideration, we find that operation of NGSO systems within this new 37.5-37.6 GHz FSS allocation with certain limitations is in the public interest. Consistent with our approach in other portions of the band, we seek to avoid making distinctions between NGSO and GSO deployments. FSS operations in the entire 37.5-40.0 band, designated principally for terrestrial FS, will be subject to specific PFD limits to protect all licensees from both in-band and out-of-band interference. To ensure GSO and NGSO FSS systems adequately protect space research operations in the 37-38 GHz band, we will require coordination between FSS systems and SRS facilities based on Recommendation ITU-R SA.1396.<sup>109</sup> At the time of application, GSO and NGSO FSS applicants must demonstrate how the proposed systems will protect SRS receiving stations. The coordination process shall include representatives from the commercial operator and the Interdepartment Radio Advisory Committee (IRAC) (and its Frequency Assignment Subcommittee (FAS)), which is an interagency committee of Federal radio frequency managers that advises the Executive Branch on the Federal Government's use of the spectrum.<sup>110</sup> We find that limiting GSO and NGSO FSS operations in this manner will not be technically burdensome.<sup>111</sup> Accordingly, we find this allocation strikes an appropriate balance between the desire for the deployment of advanced commercial FSS systems and the need to protect the Government's exploration of space through radio astronomy.

40. By extending the FSS allocation to include this 100 megahertz of spectrum, we intend to provide both GSO and NGSO satellite systems the additional flexibility to deploy applications that utilize the spectrum allocation in the most efficient manner. Our goal is to promote the deployment of service to the public by balancing the need for additional FSS downlink spectrum against the terrestrial FS and space research operators' requirements for sufficient protection against interference from in-band FSS systems. Moreover, we find that allowing FSS operators to take advantage of an additional 100 megahertz of capacity is both technically feasible and necessary to achieve a balanced band plan for the 36.0-51.4 GHz band.

41. In its comments to the Commission's Further Notice, NTIA identified the need to protect the Goldstone California SRS facility from FSS downlink transmissions.<sup>112</sup> We recognize, too, that the 37-38.6 GHz portion of the 37.0-40.0 GHz V-Band spectrum is designated for commercial wireless systems and allocated to Government fixed and mobile terrestrial services.<sup>113</sup> Commercial fixed

---

<sup>108</sup> See ITU-R S. A 1396.

<sup>109</sup> We note that coordination requirements for the Goldstone, CA SRS facility, for example, could make it difficult for FSS satellites to provide coverage to the Los Angeles area in the 37.5-38.0 GHz band, however, we also note that these services could be supplied to Los Angeles in the remainder of the 37.5-40.0 GHz band.

<sup>110</sup> Specifically, the Space Systems Subcommittee (SSS) of IRAC is responsible for the international registration and coordination of Government satellite systems and normally processes all international actions through the Commission. For more information on the IRAC, see generally NTIA Office of Spectrum Management, *Inter-department Radio Advisory Committee*, available at <<http://www.ntia.doc.gov/osmhome/irac.html>> (last visited, Mar. 19, 2003).

<sup>111</sup> As NGSO system spot beams result in a confined geographic footprint it should not be prohibitively difficult to implement an FSS NGSO system in a manner that protects an area around the Goldstone Facility.

<sup>112</sup> See Letter from William T. Hatch, Office of Spectrum Management, NTIA, to Bruce Franca, Office of Engineering and Technology, FCC (Aug. 31, 2001) (NTIA Aug. 31, 2001 *Ex Parte* Letter) at 1-2.

<sup>113</sup> 47 C.F.R. § 2.106 (2002).

45. Several commenters either oppose or raise concerns about the NTIA proposal.<sup>130</sup> These parties assert that adding a co-primary Government MSS allocation to the 40.5-41.0 GHz band would impose regulatory burdens on FSS licensees and diminish the usefulness of the satellite spectrum above 40.0 GHz for FSS by requiring coordination between FSS and Government MSS operators at 40.5-41.0 GHz.<sup>131</sup> Others assert that a co-primary Government MSS allocation in the 40.5-41.0 GHz band would be inconsistent with the outcome of the WRC-2000 and that FSS and MSS operations would be technically incompatible.<sup>132</sup>

46. We find merit in the commenters' concerns about adding a co-primary government MSS allocation in the 40.5-41.0 GHz band. First, the 40-42 GHz spectrum is designated for use by commercial FSS licensees, and a new, primary MSS allocation from 40.5-41.0 GHz would require FSS licensees in the band to protect another ubiquitously deployed service in the frequency band.<sup>133</sup> Furthermore, absent further international or domestic sharing studies that demonstrate the compatibility between FSS and MSS systems in the 40.5-41.0 GHz band, we are reluctant to allocate the MSS in the band on a co-primary basis. Third, the ITU has not allocated the 40.5-41.0 GHz band for co-primary MSS in Region 2, which includes the United States; therefore, even if we were inclined to adopt a MSS allocation in the United States, the allocation would have no interference protection from FSS operations outside of the borders of the United States.<sup>134</sup> Last, the NATO spectrum requirements are advisory in nature, and domestic needs can be satisfied through actions short of establishing a primary MSS allocation in the band. For these reasons, we decline to add a co-primary MSS allocation to the 40.5-41.0 GHz band for Government use.

47. Like several of the commercial commenters that addressed the issue, Hughes opposes a co-primary Government MSS allocation that would require commercial FSS licensees to coordinate with Government MSS operators on an equal basis. Despite its opposition to a co-primary *Government* MSS allocation, however, Hughes supports the adoption of a co-primary *commercial* MSS allocation in the 40.5-41.0 GHz band.<sup>135</sup> Hughes contends that, because commercial "licensees need the maximum flexibility to implement their systems," the Commission should establish a primary MSS allocation for

---

<sup>130</sup> See, e.g., TRW Reply at 6-7; SIA Letter at 3, Intelsat Comments at 4; Boeing Comments at 16. While Hughes also opposes a Government MSS allocation in the 40.5-41.0 GHz band, Hughes Comments at 7, Hughes supports *designating* spectrum at 40.5-41.0 GHz for non-Government MSS to promote flexible satellite deployments. Hughes Comments at 9. For a discussion of designation changes in this band, see *supra* section IV.A.

<sup>131</sup> See, e.g., SIA Comments at 3 (asserting that the proposal would "unreasonably disadvantage satellite providers and unreasonably advantage terrestrial wireless users"); Intelsat Reply Comments at 3 ("this [40.0-42.0 GHz] spectrum block should not be hindered by the addition of new services on a primary basis, as contemplated by the Commission's proposal to upgrade the MSS in the 40.5-41.0 GHz band."); see also Hughes Reply at 12 ("the Commission should not adopt a primary Government MSS allocation at 40.5-41.0 GHz unless and until it is clear that government use of that spectrum will not interfere with the deployment and operation of commercial systems in the same band."). But see Winstar Comments at 4 ("Winstar supports the FCC proposal").

<sup>132</sup> TRW Reply at 7, TRW Comments at 9-10.

<sup>133</sup> See discussion *infra* Section III.A.2.

<sup>134</sup> 47 C.F.R. § 2.106 (2002).

<sup>135</sup> Hughes claims that commercial MSS operations in the 40.5-41.0 GHz band could prove compatible with FSS systems in this band if MSS operators were to use FSS transponders to close MSS links. Hughes Reply at 13 (claiming that the use of FSS transponders would allow "MSS systems . . . [to] work in a way that creates no greater level of interference than FSS systems").

MSS allocation for possible future requirements.<sup>122</sup> The spectrum requirements of NATO are set out in the NATO Joint Civil and Military Frequency Agreement (NJFA).<sup>123</sup> The NJFA constitutes the joint agreement between the civil and military authorities of the NATO nations on the use of the radio spectrum for military purposes required by NATO forces or in support of NATO.<sup>124</sup> In general, NATO member states agree to accept NJFA standards by reflecting such needs in national allocation tables to the maximum extent possible.<sup>125</sup> The NATO Frequency Management Branch acknowledges that complete harmonization of Government frequencies among member nations is not always possible. Indeed, when nations cannot comply with specific military requirements using provisions of the NJFA, the NATO Frequency Management Branch advises national authorities that "military requirements may be satisfied nationally in civil bands or allocations."<sup>126</sup>

44. To satisfy the NATO NJFA guidelines and to fulfill domestic Department of Defense (DOD) needs, however, NTIA proposed a plan under which NTIA would accede to certain protective measures that would benefit terrestrial fixed operations in the 39.5-40.0 GHz range in exchange for the establishment of a new, primary, Government MSS allocation in the 40.5-41.0 GHz band.<sup>127</sup> NTIA requested that we amend the Government column of the Table of Frequency Allocations to add a primary MSS allocation in the 40.5-41.0 GHz band.<sup>128</sup> In the *V-band Further Notice*, we sought comment on NTIA's proposal and asked commenters to address specifically how NTIA's proposal for a primary Government MSS allocation might be implemented when WRC-2000 adopted only a secondary MSS allocation for countries in Region 2 such as the United States.<sup>129</sup>

<sup>122</sup> See Letter from Richard D. Parlow, Office of Spectrum Management, NTIA, to Richard Smith, Office of Engineering and Technology, FCC (April 30, 1997), available at <[http://haisfoss.fcc.gov/prod/ecfs/retrieve.cgi?native\\_or\\_pdf=pdf&id\\_document=1831190001](http://haisfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=1831190001)> (last visited, Feb. 23, 2003).

<sup>123</sup> See NATO Frequency Management Branch, *Response to the Commission of the European Communities['] Green Paper on Radio Spectrum Policy*, available at <http://europa.eu.int/ISPO/spectrumgp/sgpcom/nato.pdf> (last visited, Feb. 24, 2003) (Unclassified NATO Frequency Management Branch Response).

<sup>124</sup> NTIA April 30, 1997 *Ex Parte* Letter at 4.

<sup>125</sup> NTIA April 30, 1997 *Ex Parte* Letter at 4.

<sup>126</sup> See NATO Frequency Management Branch, *Response to the Commission of the European Communities['] Green Paper on Radio Spectrum Policy*, available at <http://europa.eu.int/ISPO/spectrumgp/sgpcom/nato.pdf> (last visited, Feb. 24, 2003) (Unclassified NATO Frequency Management Branch Response).

<sup>127</sup> Specifically, NTIA committed to observe the provisional PFD limits on MSS that WRC-2000 adopted and prohibit Government MSS earth stations from claiming protection from non-Government stations operating in the fixed and mobile services. See Letter from William T. Hatch, Office of Spectrum Management, NTIA, to Bruce Franca, Office of Engineering and Technology, FCC (March 2, 2001). In the *V-band Further Notice*, the Commission proposed to embody NTIA's conditional commitments in a footnote, USYYY, in the Government column of the Table of Frequency Allocations and, on this basis, tentatively concluded that it should retain the Government MSS allocation in the 39.5-40.0 GHz band. *V-band Further Notice*, 16 FCC Rcd at 12254, ¶ 23.

<sup>128</sup> See Letter from William T. Hatch, Office of Spectrum Management, NTIA, to Bruce Franca, Office of Engineering and Technology, FCC (March 2, 2001).

<sup>129</sup> *V-band Further Notice*, 16 FCC Rcd at 12254-55, ¶ 25 & n.51 (citing *WRC-2000 Final Acts*, Art. S5 (adopting a secondary MSS allocation in the 40.5-41.0 GHz band in Region 2)).

any co-primary MSS allocation in the 40.5-41.0 GHz band. Adding a new, secondary Government MSS allocation to the 40.5-41.0 GHz band will also allow us to maintain protection of FS licensees in the 39.5-40.0 GHz band by applying Footnote US382 to the Government MSS allocation from the 39.5-40.0 GHz band while permitting necessary Government MSS operations in V-band frequencies above 40.5 GHz on a secondary basis. Unlike the proposals for a primary Government allocation, moreover, proposals for a secondary commercial and Government MSS allocation in the 40.5-41.0 GHz band fully comport with the International Table of Allocations.<sup>144</sup> Accordingly, we modify the domestic Table of Allocations to reflect the addition of a secondary MSS allocation to the 40.5-41.0 GHz band in the Federal Government and Non-Federal Government columns of the Table. In so doing, we recognize that the new secondary MSS allocation will require us to develop adequate protection for primary operators prior to permitting widespread deployment of secondary MSS operations in this band. Nevertheless, we believe that the Commission can develop the service rules necessary to ensure that primary FSS operations remain fully protected from harmful interference once potential FSS and MSS operators in the band begin finalizing their plans for operation.<sup>145</sup>

### 3. Add Government FSS Allocation to the 40.5-41.0 GHz Band

50. In the *V-band Further Notice*, the Commission proposed to add a primary FSS allocation to the Government column of the Table of Frequency Allocations in the 40.5-41.0 GHz band.<sup>146</sup> This band is currently allocated for exclusive non-Government use. By designating the 37.0-40.0 GHz band for wireless services, we placed significant restrictions on Government V-band FSS spectrum not previously encumbered by restrictive PFD limits. Adding a primary FSS allocation in the 40.5-41.0 GHz band would provide Government access to additional FSS allocations where the PFD levels are less constraining. Moreover, as noted above, NTIA conditioned its willingness to accept restrictive PFD limits below 40 GHz provided that Government access to the 40.5-41.0 GHz band for FSS and MSS operations is granted.<sup>147</sup>

51. Most commenters view the proposal to allocate more primary FSS spectrum for Government use as potentially detrimental to commercial satellite operations in the band unless the Commission develops rules to establish priority and coordination between commercial and Government FSS systems.<sup>148</sup> Intelsat, for example, expresses concern that adding a new Government FSS allocation within spectrum allocated principally for commercial satellite use will pit commercial and Government interests against one another in the band.<sup>149</sup> Similarly, Intelsat fears that commercial FSS operators would lose access to essential FSS spectrum to make room for Government systems.<sup>150</sup> Hughes and TRW share

---

<sup>144</sup> TRW Comments at 8, Intelsat Reply at 5 ("Intelsat supports a secondary domestic allocation to MSS in this band, in line with the international table of frequency allocation in Section S5 of the ITU Radio Regulations.")

<sup>145</sup> As noted above, for example, some FSS operators appear to believe that requiring secondary MSS operations to use FSS terminals for MSS transmissions would adequately protect FSS operators against harmful interference. See, e.g., Hughes Reply at 13.

<sup>146</sup> *V-band Further Notice*, 16 FCC Rcd at 12255, ¶ 26.

<sup>147</sup> See *supra* Section III.B.2.

<sup>148</sup> Intelsat Comments at 5.

<sup>149</sup> Intelsat Comments at 5.

<sup>150</sup> See, e.g., Intelsat Comments at 5 ("Intelsat is concerned with [the proposal to add a Government FSS allocation at 40.5-41.0 GHz], as it may result in FSS non-Government users competing for spectrum with Government applications.")

commercial operators.<sup>136</sup> As indicated above, a decision to adopt a co-primary MSS allocation in the 40.5-41.0 GHz band must be based on whether the newly proposed MSS operations would be technically compatible with the FSS uses in the 40.0-42.0 GHz band. In this respect, we fail to see any material distinction between the technical and practical compatibility of any co-primary MSS systems – Government or commercial – with co-frequency FSS systems and with the compromise band plan that the FSS and FS operators reached at WRC-2000. The same problems of coordination and interference protection that apply to proposals for a co-primary Government MSS system apply to a co-primary commercial MSS system in the band. Moreover, even Hughes acknowledges that the “international table of allocations only contains a secondary MSS allocation for the 40.5-41.0 GHz band in Region 2.”<sup>137</sup> While Hughes then speculates that the United States might one day “successfully undertake an effort to upgrade their international allocation to primary status,” Hughes provides no sharing studies or other technical evidence that would support the allocation of additional spectrum for MSS in this band for either Government or commercial use on a co-primary basis with the FSS.<sup>138</sup> Thus, we decline to add a co-primary MSS allocation to the 40.5-41.0 GHz band for commercial use.

48. As an alternative to adopting a co-primary MSS allocation, several commenters ask the Commission to adopt a secondary MSS allocation in this band for commercial or Government systems, or both.<sup>139</sup> While noting that precise non-interference standards for secondary MSS operations would need to be developed, several commenters embrace this approach.<sup>140</sup> Intelsat, for example, supports a secondary MSS allocation because it offers the potential for permitting the deployment of new or innovative types of MSS services without unduly affecting the primary FSS operators in the band.<sup>141</sup> Similarly, TRW supports creating a secondary MSS allocation in the 40.5-41.0 GHz band because, unlike a primary service, secondary MSS licensees would bear the burden of accepting any interference that FSS operations might cause and would have to protect FSS operators from any harmful interference from MSS operations.<sup>142</sup>

49 We agree that adopting both a commercial and Government secondary MSS allocation would offer MSS licensees additional flexibility without unduly compromising the authority granted to primary FSS systems in the band.<sup>143</sup> In addition, we believe that adopting the secondary Government MSS allocation in the 40.5-41.0 GHz band would largely fulfill NTIA’s desires to meet the need of NATO and DOD operations without causing the incompatibility, interference and inequity that would accompany

---

<sup>136</sup> Hughes Reply at 12

<sup>137</sup> Hughes Reply at 12.

<sup>138</sup> Hughes Reply at 12. In addition, Hughes does not explain in any detail how coordinating a co-primary commercial MSS system would be any less burdensome than coordinating a co-primary Government MSS system.

<sup>139</sup> See, e.g., SIA Comments at 3 (supporting use of the 40.5-41.0 GHz band “on a strictly secondary basis”).

<sup>140</sup> TRW Comments at iii (“TRW supports the proposed secondary allocation of non-Government spectrum to the MSS at 40.5-41.0 GHz, provided that it is clear to all parties that this allocation is truly secondary”); SIA Comments at 3 (supporting use of the 40.5-41.0 GHz band “on a strictly secondary basis”).

<sup>141</sup> Intelsat Comments at 4.

<sup>142</sup> Section 2.104(d) of the Commission’s rules provides that stations of a secondary service shall not cause harmful interference to stations of primary services and cannot claim protection from harmful interference from stations of primary services to which frequencies are already assigned or may be assigned at a later date. See 47 C.F.R. § 2.104(d)(3)(2002); see also, e.g., TRW Comments at 8 & n.14.

<sup>143</sup> Hughes Comments at 9; Intelsat Comments at 4

While the relationship between elevation angles and service provision is not absolute,<sup>155</sup> we estimate that, with today's technology, overcoming the additional absorption of radiofrequency signals from the atmosphere that occurs in the V-band would require V-band earth stations to operate at higher elevation angles. As demonstrated in Figure 1, the higher the elevation angle that an earth station must use, the smaller the available orbital arc that remains visible to a given earth station. With a 30 degrees minimum elevation angle, the visible orbital arc would have sufficient room for significantly fewer individually located satellites to remain visible from a single earth station located in the forty-eight contiguous United States (CONUS).<sup>156</sup> As a consequence, commercial operators are legitimately concerned that – absent some type of coordination process – the government might launch and operate geostationary FSS satellites into one or more of the limited number of available orbital positions before the Commission could authorize commercial operators to deploy their systems under the current system of granting satellite applications.

53. Parties to this proceeding offered several proposals on the types of coordination procedures they believe would be necessary to ensure productive coordination between Government and commercial users.<sup>157</sup> TRW, for example, would support the proposal to add a primary FSS allocation at 40.5-41.0 for Government use, provided that the Commission indicates that Government uses will not receive priority over commercial use and that the 40.0-42.0 GHz band remains otherwise available without constraint.<sup>158</sup> Specifically, TRW suggests that the Commission adopt a footnote similar to US334, which establishes the relative authority between commercial and Government users in the 18 GHz band by requiring coordination and by limiting Government operations to a certain portion of the orbital arc.<sup>159</sup> Provided

---

<sup>155</sup> Many other factors, such as terrain obstacles, foliage density or atmospheric attenuation, can influence the provision of service to a given area.

<sup>156</sup> This estimate of the number of visible orbital locations is based upon an assumed elevation angle of 30° and assumes compliance with Commission's two-degree orbital spacing policy for FSS. For information on the Commission's two-degree spacing policy, see *Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations*, Report and Order, CC Docket No. 81-704, 54 RR 2d 577, 598, ¶ 70 (1983) (*Two-Degree Spacing Order*), see also, e.g., *Columbia Communications Corporation*, 14 FCC Rcd 3318 (Int'l Bur. 1999), *Assignment of Orbital Locations to Space Stations in the Domestic Fixed-Satellite Service*, 5 FCC Rcd 179, FCC 89-364 (1990). Subsequent to the time pleadings were filed in this proceeding, the Commission adopted the *Space Station Reform First Report and Order* to establish faster satellite licensing procedures. In addition, the Commission explained how the new procedures would be applied to the pending V-band applications, and announced that those applications would be placed on public notice shortly after this Order is released. *Amendment of the Commission's Space Station Licensing Rules and Policies*, IB Docket No. 02-34, First Report and Order and Further Notice of Proposed Rulemaking, FCC 03-102, 18 FCC Rcd 10760 (2003) (*Space Station First Report and Order*).

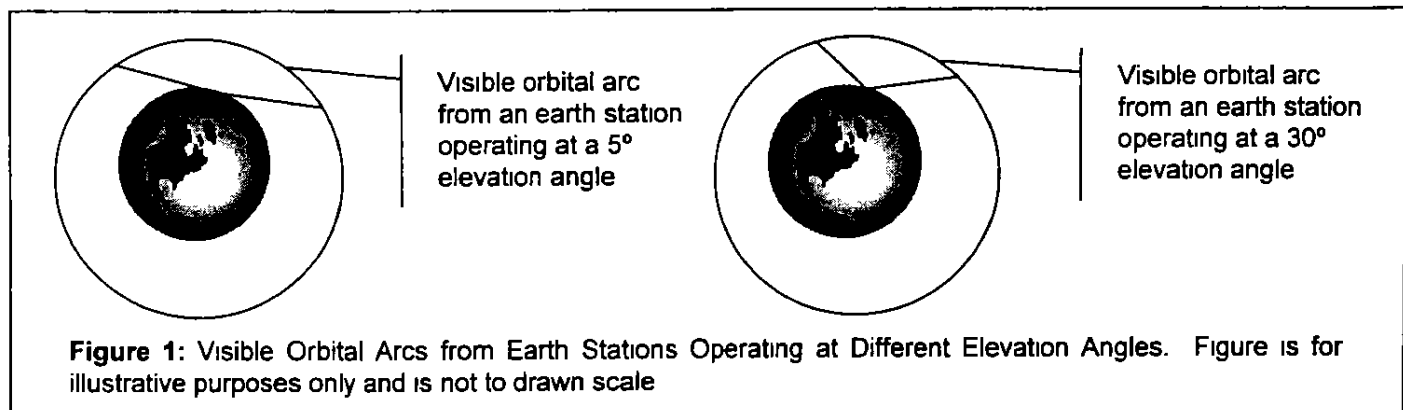
<sup>157</sup> TRW Comments at 14.

<sup>158</sup> TRW Comments at 14.

<sup>159</sup> Footnote US334 provides as follows: In the band 17.8-20.2 GHz, Government space stations in both geostationary (GSO) and non-geostationary satellite orbits (NGSO) and associated earth stations in the fixed-satellite service (space-to-Earth) may be authorized on a primary basis. For a Government geostationary satellite network to operate on a primary basis, the space station shall be located outside the arc, measured from east to west, 70 West Longitude to 120 West Longitude. Coordination between Government fixed-satellite systems and non-Government space and terrestrial systems operating in accordance with the United States Table of Frequency Allocations is required. 47 C.F.R. § 2.106, n.US334 (2002).

Intelsat's concern. Hughes states that the proposal for a new, primary Government FSS spectrum would "unfairly place the burden of coordinating Government systems solely on commercial satellite interests."<sup>151</sup> TRW adds that the "allocation of spectrum for unconstrained Government FSS operations at 41.0-42.0 GHz will have a negative impact on the commercial viability of non-Government FSS operations in that band."<sup>152</sup> Finally, each of these parties suggests that the additional government allocation would threaten to undo the hard-fought compromise that FS and FSS interests reached at WRC-2000 by diminishing the viability of the 40.5-41.0 GHz band for commercial FSS.<sup>153</sup>

52. NTIA has supported the soft segmentation arrangement that the U.S. succeeded in obtaining at WRC-2000. Further, it is clear that the constraints arising from the soft segmentation arrangement make Government access to FSS spectrum above 40 GHz a necessity. We note, however, the commercial operators' contentions that unbridled Government use of this commercial bandwidth would not serve the public interest and should not be permitted. The potential for coordination difficulties among commercial and Government systems when both users hold co-primary allocations in the same band is particularly acute in the V-band where frequency propagation characteristics render access to spectrum at particular orbital locations even more limited than in other frequency bands. As in any frequency band, the satellite orbital locations visible to a satellite earth station are based on the elevation angle requirements of the earth station. The earth station elevation and azimuth angles define the visible geostationary arc (or visible arc) from locations in the United States. In lower frequency bands, satellite operators can more reliably establish communications links to satellite systems at elevation angles as low as 5°. <sup>154</sup>



<sup>151</sup> Hughes Comments at 7.

<sup>152</sup> TRW Reply at 6.

<sup>153</sup> See, e.g., Hughes Reply at 13 (asserting that adding a Government FSS allocation at 40.5-41.0 GHz unfairly shifts a burden currently shared by both terrestrial FS and FSS operators to one that FSS operators alone must bear), Hughes Comments at 7-8 (same).

<sup>154</sup> In Ku-band, for example, satellite operators typically require a minimum elevation angle of ten degrees or greater in order to provide reliable service to a particular location, although service in Alaska has often been offered at elevation angles as low as five degrees. See *Policies and Rules for Direct Broadcast Satellite Service*, 17 FCC Rcd 11331, 11358, ¶ 55 (2002) (citations omitted). Satellite operators could establish communications links with satellites at angles of less than five degrees, but the Commission generally prohibits earth stations from operating at these very low elevation angles due to the likelihood of interference to terrestrially based communications networks. See 47 C.F.R. § 25.205 (2002).



commercial operators to coordinate their operations on an co-primary basis.<sup>165</sup> The coordination process shall include representatives from the commercial operator and the Interdepartment Radio Advisory Committee (IRAC), which is an interagency committee of Federal radio frequency managers that advises the executive branch on the Federal Government's use of the spectrum.<sup>166</sup> Coordinated commercial and Government use of the 40.5-41.0 GHz band will result in a mutually interference-free operating environment for the deployment and operation of commercial systems. Should the parties to the coordination prove unable to coordinate their planned systems in a reasonably timely fashion, however, the Commission and NTIA will work under the IRAC process to find a resolution of any coordination disputes.

#### 4. Add FSS Allocation to the 41.0-42.0 GHz Band

56. In the *V-band Further Notice*, the Commission proposed to add a primary FSS allocation to the 41.0-42.0 GHz band. Because WRC-2000 adopted PFD limits that favor terrestrial uses below 40.0 GHz and that favor satellite uses from 40.0-42.0 GHz, the Commission proposed to redesignate the spectrum available for wireless services from 41.0-42.0 GHz to 37.6-38.6 GHz and to redesignate the spectrum available for satellite use from 37.6-38.6 GHz to 41.0-42.0 GHz.<sup>167</sup> Consequently, the Commission proposed to add a primary FSS allocation to the 41.0-42.0 GHz band to achieve the redesignation of the 41.0-42.0 GHz band for FSS use.<sup>168</sup>

57. To meet the needs of commercial FSS operators and consolidate the compromise plan established for the V-band, commenters unanimously support the proposed FSS allocation.<sup>169</sup> TRW, for example, notes that adding a primary FSS allocation to the 41.0-42.0 GHz band not only would enable "global [high-density] FSS operations at 40.0-42.0 GHz," but also would "comport[] fully with the soft segmentation division of spectrum between satellite and terrestrial users agreed to by WRC-2000."<sup>170</sup> Boeing adds that the additional spectrum for FSS operations in the 41.0-42.0 GHz band would "promote[] the more efficient design and deployment of [FSS] systems."<sup>171</sup> Given the support for the Commission's proposal from commenters, we adopt the proposal to add a primary non-Government FSS allocation in the 41.0-42.0 GHz band and modify the Table of Allocations in Section 2.106 of our rules accordingly.<sup>172</sup>

---

<sup>165</sup> Coordination between Government and commercial operations will ensure equitable access to the shared FSS allocations.

<sup>166</sup> Specifically, the Space Systems Subcommittee (SSS) of IRAC is responsible for the international registration and coordination of Government satellite systems and normally processes all international actions through the Commission. For more information on the IRAC, see generally NTIA Office of Spectrum Management, *Interdepartment Radio Advisory Committee*, available at <<http://www.ntia.doc.gov/osmhome/irac.html>> (last visited, Mar. 19, 2003).

<sup>167</sup> See *WRC-2000 Final Acts*, Art. S 21.

<sup>168</sup> *V-band Further Notice*, 16 FCC Rcd at 12255, ¶ 27.

<sup>169</sup> See, e.g., Hughes Reply at 6 & n 23; Winstar Comments at 5; TRW Comments at 7; Boeing Comments at 17; Hughes Comments at 5-6, 8; Intelsat Comments at 2, 6; SIA Comments at 2.

<sup>170</sup> TRW Comments at 7.

<sup>171</sup> Boeing Comments at 17.

<sup>172</sup> A primary allocation for the fixed and mobile services still remains in the 41.0-42.0 GHz band. What, if any, use by these other services will be addressed in a future rulemaking.

the Commission develops some type of coordination procedure between commercial and Government users, several parties express support of the additional Government FSS allocation.<sup>160</sup>

54. We recognize that both Government and commercial systems must remain sufficiently sure of their access to orbital and spectrum resources if they are to proceed with research, development and production of their planned space-station systems. At the same time, several years will pass before either commercial or Government systems are ready to deploy space stations. If experience is any guide, some will choose not to implement planned systems while others will implement currently unplanned systems.<sup>161</sup> Of course, we can and frequently do attempt to narrow the potential for interference when we can reasonably anticipate that interference would occur. In this case, however, the Government may or may not deploy systems in the band, and, given this uncertainty, it is difficult for us to determine, *ex ante*, whether and how we should limit Government systems. For us to support confining Government systems to one small portion of the orbital arc as TRW has proposed would be particularly inappropriate because we cannot be certain that this particular method of coordination represents a cost-effective or necessary restriction.

55. Moreover, the Commission recently revised its satellite licensing procedures to speed the process for acting on satellite applications. Specifically, the Commission explained how it would license V-band satellite systems.<sup>162</sup> The Commission also explained that all pending V-band applications would be treated as though they were filed at the same instant.<sup>163</sup> In addition, the Commission directed the International Bureau to issue a public notice shortly after the release of this Order, to explain these procedures in more detail, and to give applicants an opportunity to amend their applications, if necessary.<sup>164</sup> The Public Notice can also identify any known orbit/spectrum requirements of the Government. In the meantime, rather than attempt to render a judgment now about the relative future demand for orbital and spectrum resources among Government and commercial systems in the V-band, we will add a Government FSS allocation to the band, however, we will require both Government and

---

<sup>160</sup> Boeing Comments at 16 ("Boeing does not object to a Government FSS allocation in principle, however, any Government FSS allocation in this band should be on a secondary basis, rather than co-primary with non-Government FSS."), TRW Reply at 6 ("TRW . . . believes that, with the imposition of sensible limits on government FSS operations, a place can be found in the band for government FSS systems to meet their objectives in a way that does not jeopardize the commercial viability and business objectives of non-government FSS systems"); *see also* Hughes Reply at 13 (asserting that the Commission should not adopt a primary Government MSS allocation at 40.5-41.0 GHz unless and until it is clear that government use of that spectrum will not interfere with the deployment and operation of commercial systems in the same spectrum); Hughes Comments at 7-8 (same).

<sup>161</sup> *See, e.g., Public Notice of Dismissal*, Report No. SAT-00125, Lockheed Martin Corporation (d/b/a Marine Systems), File Nos. SAT-LOA-19970925-0100 through-0108 (rel., Oct. 30, 2002), available at <[http://www.fcc.gov/Daily\\_Releases/Daily\\_Business/2002/db1030/DOC-227913A1.pdf](http://www.fcc.gov/Daily_Releases/Daily_Business/2002/db1030/DOC-227913A1.pdf)> (last visited, Mar. 28, 2003), citing Letter from Gerald C. Musarra, Vice President Trade and Regulatory Affairs, Lockheed Martin, to Marlene Dortch, Secretary, FCC (Sept. 13, 2002).

<sup>162</sup> *Space Station Reform First Report and Order* at 10865, ¶ 279.

<sup>163</sup> *Space Station Reform First Report and Order* at 10865, ¶ 279. Previously, the "processing round" system would combine satellite applications into groups and then processes mutually exclusive satellite applications together. *See Amendment of the Commission's Space Station Licensing Rules and Policies*, Notice of Proposed Rulemaking and First Report and Order, 17 FCC Rcd 3847, 3850, ¶ 5-6 (2002) (*Space Station Licensing Reform Notice*), available at <[http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-02-45A1.doc](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-02-45A1.doc)> (last visited Mar. 18, 2003). The Commission has noted that "the processing round licensing procedures involve multiple, often quite intricate and time-consuming steps." *Id.* at 3850, ¶ 5.

<sup>164</sup> *Space Station Reform First Report and Order* at 10865, ¶ 279.

reduced need for HAPS spectrum and in hopes of providing additional spectrum for terrestrial FS users, the Commission proposed to return the 42.5-43.5 GHz and 47.2-48.2 GHz bands to their original configurations of shared Government and commercial operations.<sup>181</sup> Specifically, the Commission proposed to reverse the commercial-Government spectrum swap and return the 42.5-43.5 GHz and 47.2-48.2 GHz bands to shared commercial-Government use by adding non-government allocations to the 42.5-43.5 GHz band.<sup>182</sup> Other things being equal, most operators would prefer to operate at the lower frequencies in the 42.5-43.5 GHz band than the higher frequencies in the 47.2-48.2 GHz band due to the lower band's somewhat superior propagation characteristics. Several parties to this proceeding accordingly support the proposal to once again make the 42.5-43.5 GHz band available for commercial use.<sup>183</sup>

62. The Government, however, does not support the change. NTIA recognizes that "there is a degree of merit" in harmonizing the 42.5-43.5 GHz bands globally for commercial operations, but asserts that the 42.5-43.5 GHz band remains peculiarly appropriate for exclusive Government operations for several reasons. First, some Government systems currently operate in the 42.5-43.5 GHz band,<sup>184</sup> and the 42.5-43.5 GHz band is immediately adjacent to the Government satellite band at 43.5-45.5 GHz. Second, the 42.5-43.5 GHz band could accommodate an expansion of Government Earth-to-space operations. Third, NTIA has encouraged federal agencies over the last few years to use the 42.5-43.5 GHz band as a substitute for the 37.0-38.6 GHz band.<sup>185</sup> For these reasons, NTIA views commercial operations in the 42.5-43.5 GHz band as inimical to existing and future Government operations in the band.

63. Hughes agrees with NTIA's reasoning and recommends that the Commission should maintain the current 42.5-43.5 GHz allocation for exclusive Government use and the 47.2-48.2 GHz band for exclusive non-Government use.<sup>186</sup> According to Hughes, allocating the 47.2-48.2 GHz band for exclusive Government use would prevent commercial FSS satellites from using this much-needed uplink allocation while the hoped-for reclamation of the 42.5-43.5 GHz band for commercial FSS would probably not permit extensive commercial FSS use because radio astronomy operates in that band.<sup>187</sup> Comments from the radioastronomy community support Hughes' concerns. The National Academy of Sciences notes that radio astronomy facilities in this band are particularly susceptible to interference.<sup>188</sup> If the Commission were to reintroduce commercial operations into the 42.5-43.5 GHz band, the National Academy of Sciences recommends that the Commission prohibit aeronautical mobile uses, establish and

---

<sup>181</sup> As an alternative, the Commission proposed reallocating the 42.5-43.5 GHz band for exclusive non-Government use, except for RA, and reallocating the 47.2-48.2 GHz band for exclusive Government use. *V-band Further Notice*, 16 FCC Rcd at 12256, ¶ 30. No one supported this proposal because it would have virtually all of the drawbacks that NTIA finds in the principal proposal with far fewer benefits to commercial operators. See TRW Comments at 13; Hughes Comments at 9.

<sup>182</sup> *V-band Further Notice*, 16 FCC Rcd at 12255-56, ¶ 29.

<sup>183</sup> Intelsat Comments at 6, TRW Comments at 13; SIA Comments at 2.

<sup>184</sup> NTIA Aug. 31, 2001 *Ex Parte* Letter at 2. For example, NTIA notes that the National Science Foundation conducts extensive radio astronomy observations in the band

<sup>185</sup> NTIA Aug. 31, 2001 *Ex Parte* Letter at 2.

<sup>186</sup> Hughes Comments at 9.

<sup>187</sup> Hughes Comments at 9

<sup>188</sup> CORF Comments at 6.

58. Boeing and TRW indicated in their comments that the Commission should not adopt a co-primary, Government FSS allocation in this band.<sup>173</sup> NTIA has expressed no interest in pursuing a primary, Government FSS allocation in the 41.0-42.0 GHz band,<sup>174</sup> and we did not propose an additional FSS allocation in the 41.0-42.0 GHz band for Government FSS. We, therefore, make no finding on the comment by TRW or Boeing.

**5. Consider Adding Fixed and Mobile Allocations for Non-Government Use to the 42.5-43.5 GHz Band**

59. In the *V-band Further Notice*, the Commission sought comment on whether to add primary, non-Government Fixed and Mobile allocations to the 42.5-43.5 GHz band and then designate the band for wireless services.<sup>175</sup> WRC-2000 identified the 42.5-43.5 GHz band as available for HDFS. In the United States, this band is currently allocated on a co-primary basis to FS, FSS (Earth-to-space), Mobile, and Radio Astronomy (RA) services. These allocations currently are for exclusive Government use, except for RA, in which we also permit non-Government uses. Although each of the active services in the 42.5-43.5 GHz band (FS, Mobile, and FSS) can theoretically share with RA to some degree, when the Commission issued the *V-band Further Notice*, it said it expected that non-Government FS operators would have a particular interest in operating in this band because WRC-2000 identified the 42.5-43.5 GHz band as available for HDFS.<sup>176</sup>

60. As the Commission noted in the *V-band Further Notice*, commercial use of the 42.5-43.5 GHz band is in some sense linked to Government use of the 47.2-48.2 GHz band.<sup>177</sup> Prior to 1998, Government and commercial uses shared allocations in the 42.5-43.5 GHz band on a co-primary basis. In 1998, however, the Commission chose to separate Government and commercial operators by establishing the 42.5-43.5 GHz band for exclusive Government use and the 47.2-48.2 GHz band for exclusive commercial use. In choosing to adopt the exclusive non-Government allocation for the 47.2-48.2 GHz band, we relied on our desire to serve the needs of High Altitude Platform Service (HAPS) operators.

61. In the *V-band Further Notice*, the Commission stated that HAPS proponents “have withdrawn [their] interest to develop . . . service in the 47.2-48.2 GHz band.”<sup>178</sup> Indeed, many participants in this proceeding affirm that HAPS has not developed as anticipated.<sup>179</sup> While SkyTower, a proponent of HAPS technologies, states that HAPS remains a potentially important new delivery mechanism for advanced telecommunications services, SkyTower acknowledges that no HAPS proponent currently envisions a need for a “specific HAPS service in a particular band.”<sup>180</sup> In light of the

<sup>173</sup> See Boeing Comments at 16 (“Requiring commercial FSS systems to shoulder the burden of sharing with Government FSS would upset this careful balance.”), TRW Reply at 5.

<sup>174</sup> NTIA Mar. 2, 2001 *Ex Parte* Letter.

<sup>175</sup> *V-band Further Notice*, 16 FCC Rcd at 12255, ¶ 28.

<sup>176</sup> *V-band Further Notice*, 16 FCC Rcd at 12255-56, ¶¶ 28-29.

<sup>177</sup> *V-band Further Notice*, 16 FCC Rcd at 12256, ¶ 30.

<sup>178</sup> *V-band Further Notice*, 16 FCC Rcd at 12256, ¶ 30.

<sup>179</sup> Boeing Comments at 5-6; Spectrum Astro Comments at 7; Hughes Comments at iii, 5; SIA Comments at 2.

<sup>180</sup> SkyTower Reply at 3. SkyTower states that HAPS proponents now view “HAPS as multi-purpose platforms that can be used by operators in existing services.” *Id.* According to SkyTower, “there are now several companies, including SkyTower, pursuing alternative strategies for deploying HAPS.” *Id.* at 3-4.

Third, the Hughes proposal would leave the 37.5-40.0 GHz downlink band unpaired with any comparable FSS uplink band. FSS operators could seek use of the remaining one gigahertz of spectrum in the 47.2-48.2 GHz band in conjunction with their gateway operations in the 37.5-40.0 GHz band. Any asymmetrical pairings in these bands, and any associated constraints, are inherent in decisions we adopt today. Such constraints can, to some extent, be alleviated by using techniques that result in spectrum spreading on the downlink. That is, FSS gateway operation in a high-density fixed service band, consistent with today's Order, will necessitate the use of lower FSS downlink PFDs than in other FSS bands. Some of the FSS techniques available for use in this controlled PFD environment include the use of lower-rate modulations and increased in-channel coding. These techniques decrease the information data rate per hertz of downlink bandwidth. One option to maintaining the FSS link capacity would be to increase the FSS downlink transmission bandwidth. Therefore, the FSS operators could potentially make use of wider bandwidths in the FSS downlink spectrum at 37.5-40.0 GHz than in the 47.2-48.2 GHz uplink band. For this reason, we preserve the 47.2-48.2 GHz V-band FSS uplink allocation for possible asymmetrical pairing with the 37.5-40.0 GHz band.

## 6. Protection of Radio Astronomy in the 42.5-43.5 GHz Band

68. In the *V-band Further Notice*, the Commission proposed to adopt aggregate PFD limits on certain systems licensed to operate in the 41.5-42.5 GHz band in order to protect certain RA operations.<sup>194</sup> Under ITU footnote 5.551G, the aggregate PFD in the 42.5-43.5 GHz band produced by all space stations in any non-geostationary system operating in the 41.5-42.5 GHz band is not to exceed -167 dB(W/m<sup>2</sup>) in any one megahertz band at the site of an RA station for more than two percent of the time.<sup>195</sup> Footnote 5.551G also restricts geostationary FSS or BSS operations in the 42.0-42.5 GHz band to PFD limits in the 42.5-43.5 GHz band, of -167 dB(W/m<sup>2</sup>) in any one megahertz band at the site of an RA station.<sup>196</sup> Under the Commission's proposed approach, a modified version of footnote 5.551G of the ITU Radio Regulations would be incorporated into the domestic Table of Frequency Allocations.<sup>197</sup> As adopted by WRC-2000, footnote 5.551G was provisional and subject to modification by WRC-2003.<sup>198</sup>

69. As another measure to protect RA, the Commission sought comment on NTIA's request to consider deleting BSS from the 42.0-42.5 GHz band entirely. The Commission noted NTIA's concern that the limits adopted in ITU footnote 5.551G might not adequately protect RA operations in the 42.5-43.5 GHz band.<sup>199</sup> While some commenters from the RA community support deleting BSS,<sup>200</sup> others oppose the measure with the hope that the Commission can develop an alternative that accommodates the needs of both BSS and radio astronomy operations.<sup>201</sup> Other commenters noted certain proposals to WRC-2003 that would have permitted greater satellite-use of the 42.0-42.5 GHz band and argue the

<sup>194</sup> See *V-band Further Notice*, 16 FCC Rcd at 12256-7, ¶ 32.

<sup>195</sup> See *V-band Further Notice*, 16 FCC Rcd at 12257, ¶ 32.

<sup>196</sup> See *V-band Further Notice*, 16 FCC Rcd at 12257, ¶ 32.

<sup>197</sup> See *V-band Further Notice*, 16 FCC Rcd at 12256, ¶ 32.

<sup>198</sup> See *V-band Further Notice*, 16 FCC Rcd at 12257, ¶¶ 32-33.

<sup>199</sup> See *V-band Further Notice*, 16 FCC Rcd at 12257, ¶ 34.

<sup>200</sup> CORF Comments at 4-5; NTIA Comments at 2.

<sup>201</sup> Astrolink Comments at 6-7.

enforce geographic separation between RAS observatories and fixed and mobile users, and mandate detailed coordination procedures.<sup>189</sup>

64. We agree with those commenters that recommend against returning the 42.5-43.5 GHz and 47.2-48.2 GHz band to their pre-1998 allocations given that federal Government users already operate in the 42.5-43.5 GHz band and that NTIA appears to have relied on the Commission's 1998 spectrum-swap decision in encouraging other federal agencies to use the band as a substitute for the 37.0-38.6 GHz band. Although we agree with those commenters that note that the lower frequencies generally offer better propagation characteristics and recognize this band's potential for commercial use, extensive radioastronomy operations in the 42.5-43.5 GHz band make these same frequencies less than ideal candidates for immediate commercial operations. Prudent spectrum management supports the continued separation of government and non-Government operations in this portion of the V-band.

65. In light of our decision not to return the 42.5-43.5 GHz band to shared Government and commercial use, we will preserve the 47.2-48.2 GHz band for exclusive commercial use. Currently, the 47.2-48.2 GHz band is allocated on a co-primary basis to terrestrial fixed and mobile services and FSS (Earth-to-space).<sup>190</sup> While HAPS operators indicate that they no longer need an exclusive band dedicated to HAPS use, commercial operators in one or more of the services allocated to the 47.2-48.2 GHz may prove able to use this band to serve the public. Indeed, both TRW and Hughes identify this band as an important potential uplink for V-band FSS systems.<sup>191</sup> The 47.2-48.2 GHz band, however, contains no incumbent services. Given the nascent development of technology in this band, we are not willing to conclude at this time that sharing among the co-primary terrestrial and satellite services in this band is entirely impractical. Therefore, we conclude that allocating the 47.2-48.2 GHz band exclusively for FSS use at this time would be inappropriate.

66. Hughes asserts that FSS requires three gigahertz of FSS uplink spectrum and three gigahertz of downlink spectrum in the V-band.<sup>192</sup> We have identified two gigahertz of FSS downlink spectrum in the 40.0-42.0 GHz band and two gigahertz of FSS uplink spectrum in the 48.2-50.2 GHz band. Hughes proposes that we identify an additional one gigahertz of FSS downlink spectrum to pair with the one gigahertz of FSS uplink spectrum at 47.2-48.2 GHz. Hughes suggests two alternatives for identifying this downlink spectrum: either one gigahertz of FSS downlink at 37.6-38.6 GHz, or 500 megahertz in the 37.6-38.6 GHz band and an additional 500 megahertz at 42.0-42.5 GHz.

67. We decline to adopt Hughes' proposals. First, the 37.6-38.6 GHz band is designated for FS use with FSS gateway operations permitted under the soft-segmentation approach adopted in this item. Reallocation to FSS is, therefore, inconsistent with our actions taken herein, which carefully balances the equities between FS and FSS interests in the V-band. Second, the Commission is deferring action on the 42.0-42.5 GHz band with respect to the BSS and, consequently, the FSS allocation. Since the 42.0-42.5 GHz FSS allocation would be adjacent to the radio astronomy allocation at 42.5-43.5 GHz, FSS operations in this band potentially could be affected by how radio astronomy service is protected.<sup>193</sup> However, the FS designation in the 42.0-42.5 GHz band is still in effect, even though the conditions for operating at the satellite PFD limits for the band will be considered in a future Commission proceeding.

---

<sup>189</sup> CORF Comments at 6-7.

<sup>190</sup> 47 C.F.R. § 2.106 (2002).

<sup>191</sup> TRW Reply at 11.

<sup>192</sup> Hughes Reply at 1.

<sup>193</sup> See *infra* III.B.6.

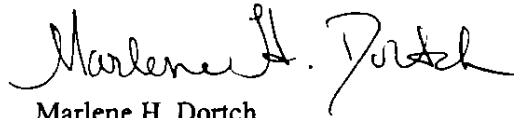
**IV. ORDERING CLAUSES**

72. IT IS ORDERED that, pursuant to Sections 4(i), 7(a), 303(c), 303(f), 303(g), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 157(a), 303(c), 303(f), 303(g), 303(r), Part 25 of the Communications Rules IS AMENDED, as specified in Appendix B, effective 30 days after publication in the Federal Register.

73. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Report and Order, including the Initial and Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

74. Additional Information. For further information concerning this rulemaking proceeding contact David Strickland and (202) 418-0977 (internet: [david.strickland@fcc.gov](mailto:david.strickland@fcc.gov)), International Bureau, Federal Communications Commission, Washington, DC 20554.

FEDERAL COMMUNICATIONS COMMISSION

A handwritten signature in black ink, appearing to read "Marlene H. Dortch", is written over the printed name.

Marlene H. Dortch  
Secretary

Commission should reconsider its allocation decision for this band and allocate this spectrum for both FSS and BSS.<sup>202</sup>

70. The *V-band Further Notice* recognized that the PFD limits adopted in footnote 5.551G were provisional and therefore subject to modification by WRC-2003.<sup>203</sup> Since release of the *V-band Further Notice*, moreover, four competing proposals have been submitted to the ITU-R in preparation for WRC-2003 regarding the final language of footnote 5.551G.<sup>204</sup> Several commenters argue that the Commission should not adopt the proposals outlined in the *V-band Further Notice* because the ITU-R is currently examining these proposals as well as a broader study, established by the Final Acts of WRC-2000, on the appropriate PFD protections afforded to RA.<sup>205</sup> WRC-2003 has concluded its work on the issue of RAS protection by suppressing footnote 5.551G and adopting two new footnotes, 5.551H and 5.551I. These new footnotes place PFD limits on (both NGSO and GSO) FSS and BSS systems, operating in the 42.0-42.5 GHz band, to protect RA operations in the 42.5-43.5 GHz band. We are in the process of reviewing the results of WRC-2003 and the approach adopted there to protect RA. We will address the proper PFD limit necessary to protect RA in an upcoming rulemaking proceeding.

71. We also conclude that deleting the BSS allocation, and/or adding an FSS allocation, would be premature prior to the completion of our domestic proceeding on the protection requirements for RA.<sup>206</sup> The proper level of protection for RA remains the subject of active debate. In the interest of both continuing open, productive debate and of promoting international comity, we defer decision on NTIA's request to delete BSS from the 42.0-42.5 GHz band.

---

<sup>202</sup> Hughes Reply at 11; Hughes Comments at 8-9 ("If WRC-03 and the Commission sufficiently relax the out-of-band emission pfd limit applicable to the 42.5-43.5 GHz band to allow satellite use of the 42.0-42.5 GHz band, and if the Commission determines that the band is a better alternative for additional downlink spectrum, then the Commission should also add an FSS allocation at 42.0-42.5 GHz and should designate that band for FSS and BSS use."); TRW Comments at 15 ("The proposal not to allocate spectrum for FSS at 42.0-42.5 GHz is in clear conflict with U.S. positions at WRC-97 and WRC-2000 advocating just the opposite."); Boeing Reply at 7; *but see* CORF Reply at 2 (expressing concern about the potential for harmful interference from BSS and FSS operations in the 42.0-42.5 GHz band.).

<sup>203</sup> See *V-band Further Notice*, 16 FCC Rcd at 12257, ¶ 34.

<sup>204</sup> Section 4.5 of the Conference Preparatory Meeting (CPM) report to WRC-2003 describes recent analysis of the required power flux density limits to protect RA in the 42.5-43.5 GHz band from adjacent band satellite services. The proposed PFD limits to protect radio astronomy vary between -116 dB (W/(m<sup>2</sup> • GHz)) to -153 dB (W/(m<sup>2</sup> • GHz)) depending on the type of RA application analyzed. The CPM report discusses four possible models to revise footnote 5.551G indicating that a one-size fits all approach may not be necessary for RA protection. Footnote 5.551G and the proposed footnote USXXX are a one-size fits all approach to RA protection. Current ITU studies question the need for a stringent -167 dB (W/m<sup>2</sup>) protection level in any 1 MHz band. The four new models incorporate the observation type in defining PFD limits for GSO and non-GSO satellite networks in the 41.5-42.5 GHz band. Each of these models has advantages and disadvantages, and further study within the ITU-R will likely yield adoption of a single method by WRC-2003.

<sup>205</sup> Astrolink Reply at 3 (arguing that "[d]ecisions regarding protection of radio astronomy should be deferred until after the ITU-R completes its analysis on the issue."); TRW Comments at 15-18 (urging the Commission to await the completion of a pending ITU-R study into the "possible steps RA can take to reduce susceptibility to interference into its sites."); Intelsat Comments at 7 (asking the Commission to "defer a decision on the domestic allocation or designation of the band 42.0-42.5 GHz until completion of the work by the ITU-R.") Panamsat at 4 (opposing the adoption of a modified version of footnote 5.551G as it "ignores the pending ITU-R study . . . into the possible steps radio astronomy can take to reduce susceptibility to interference into its sites.").

<sup>206</sup> Astrolink Reply at 9



